January, 1946 Vol. 35, No. 1

Periodicals

INDUSTRIAL ARTS AND VOCATIONAL EDUCATION

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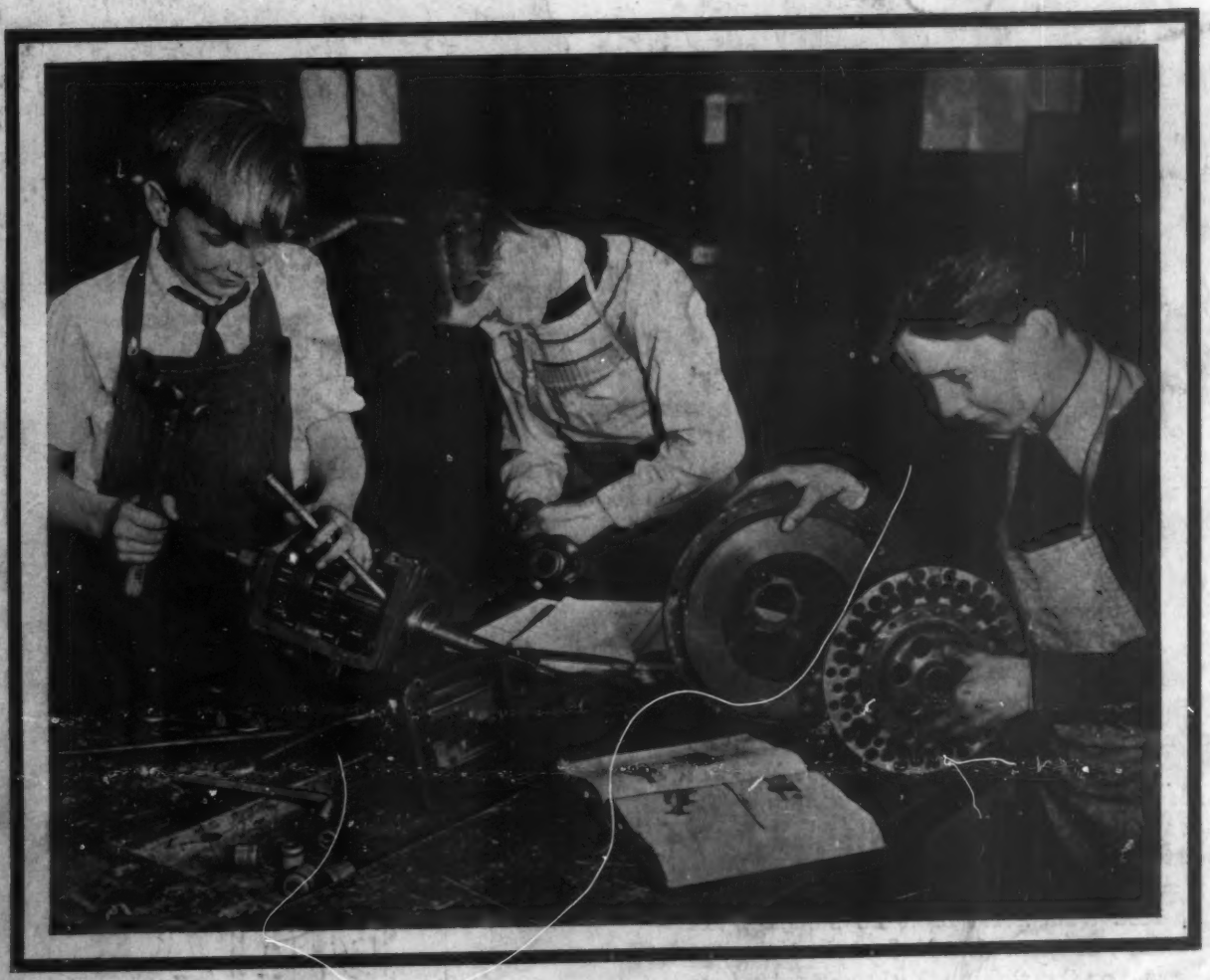
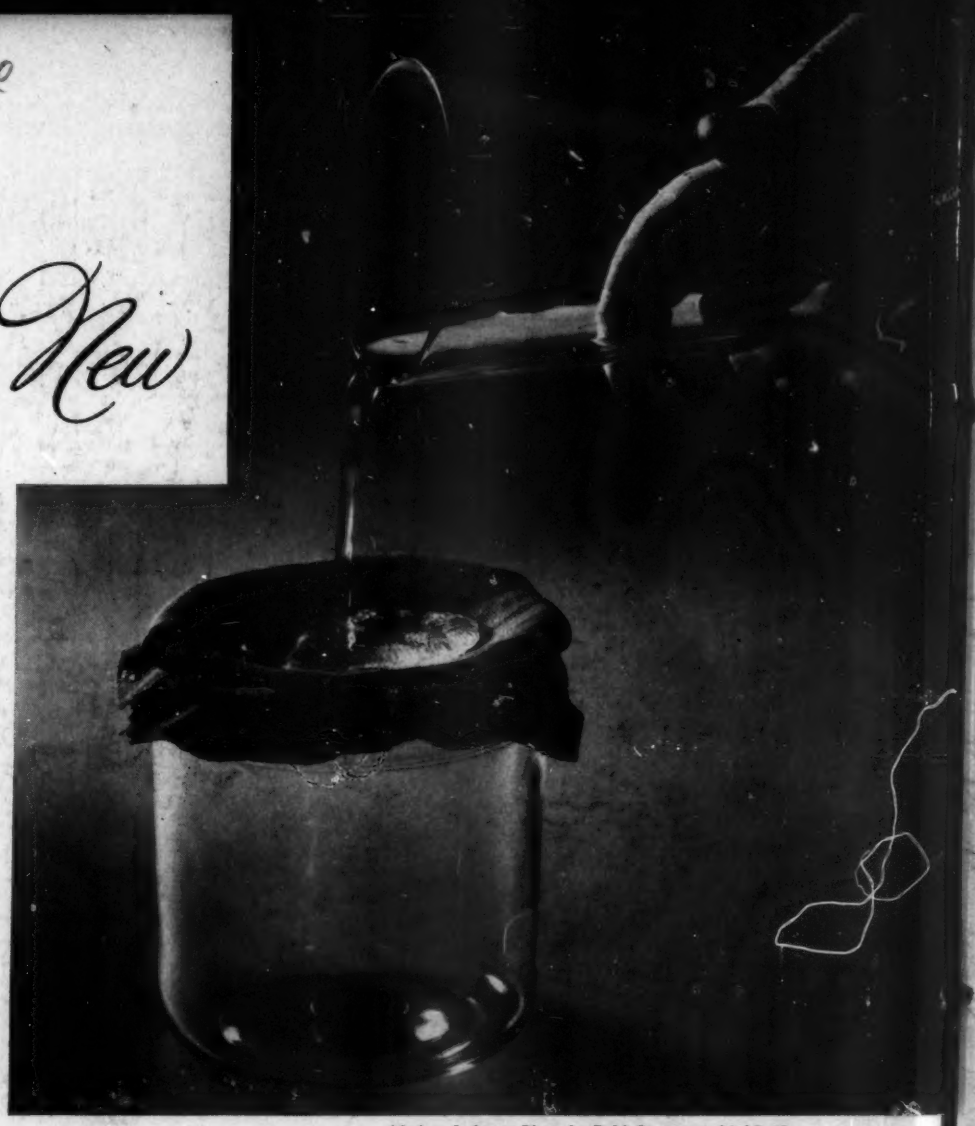


The Shop Teachers' Professional Magazine

R v.35 1946

WHEN *Something New* IS *Added*



Modern Industry Photo by F. M. Demarest, 10-15-45

IF it's true what they say about Melamine, then you won't have to worry any longer about being caught in the rain. Your hat *won't* pulp into a shapeless mass. Your suit *won't* shrink or lose its crease. Your paper bag *won't* split and spill the groceries all over the walk. For when materials are treated with Melamine, one of the newer plastics, they are rendered impervious to water, to stains of ink and fruit... yet there is no difference in their feel or looks.

This is another example how the character of anything in nature can be changed with the application of the right modifying influence... a truth that applies full force to human nature as well. In the work that must be done with the youth of our nation to fit these lads not only for successful individual achievement but for successful citizenship as well, it is a truth to which every educator must resort. Every lad has native energy, has a hunger for success of some kind, genuinely possesses ambition of a sort. What holds some boys back is not lack of opportunity or ability but lack of the influence that sets their feet on the right path, that sets their desires on the right goals, that kindles their will to go on.

The "Melamine" that can work these often revolutionary changes is to be found in the familiar things of school routine. The selection of the drawing instruments a student will use, for example, can be a turning point in the boy's life. Tools of school discipline as well as adult activity, tools that great engineers use in great achievements, a fine drawing set can kindle the youthful imagination and color all the work that he does. Here is the link between himself and a possibly great future, the tie between him and great men. Certainly there is no room for petty economy when values like these are at stake.

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Used as teaching and study aids, this material will simplify teaching and help you to train better lathe operators. Sample copies of booklets will be mailed without charge on request from any school shop instructor or supervisor.

"SOUTH BEND MACHINE SHOP COURSE"—Widely used by leading schools for instruction in machine shop practice. Thirty-two pages, size 8½"x11". Includes working drawings for projects.

"HOW TO RUN A LATHE"—Complete manual and reference book on the operation and care of the back-geared, screw-cutting lathe. 128 pages 5⅛"x7⅞", 340 illustrations.

FILMS—Based on "How To Run a Lathe" book—in black and white, or color. Available on loan or purchase basis. Write for information.

"HOW TO CUT SCREW THREADS"

Gives step-by-step instructions for cutting screw threads in the lathe. Contains 24 pages, 82 illustrations.

"HOW TO GRIND CUTTER BITS"

A useful, highly informative book which explains and illustrates in detail how to grind and sharpen lathe tool cutter bits. Contains 16 pages, 51 illustrations. Size 6"x 9".

FOUR BULLETINS ON THE CARE OF THE LATHE

Each booklet deals with one phase of lathe care essential for satisfactory lathe performance. Booklets will be supplied in reasonable quantities without charge to school shop supervisors and instructors.

BULLETIN H-1—"KEEP YOUR LATHE CLEAN"—tells how, why, and with what to clean the vital parts of the lathe. Contains 16 pages, 19 illustrations. Size 6"x9".

BULLETIN H-2—"OILING THE LATHE"—explains where, how, and with what oil to lubricate the lathe. Size 6"x 9", 16 pages, 19 illustrations.

BULLETIN H-3—"THE INSTALLATION AND LEVELING OF THE LATHE"—gives instructions for installing and leveling the lathe correctly. Contains 20 pages, 20 illustrations. Size 6"x9".

BULLETIN H-4—"KEEP YOUR LATHE IN TRIM"—gives instructions for making necessary adjustments, checking power supply, and keeping the lathe in best operating condition. Contains 32 pages, 39 illustrations. Size 6"x9".

BLUE PRINT WALL CHARTS

Large simulated blueprints, suitable for framing, show the parts of the lathe, decimal equivalents of fractions up to 1-inch, and 17 "Pointers" on "How To Become A Machinist." Sample copies free on request.

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A booklet prepared for those interested in modern school shops and their machine equipment. Shows many fine installations in all types of large and small school shops. Size 11" x 8½", 24 pages.

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- ☐ "HOW TO GRIND CUTTER BITS"
- ☐ LATHE BULLETINS H-1, H-2, H-3, & H-4
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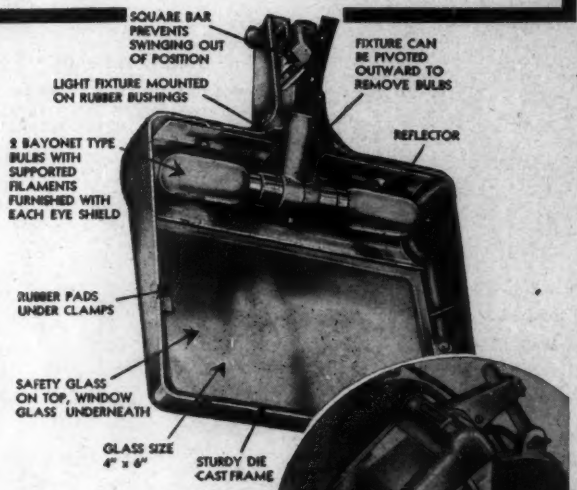
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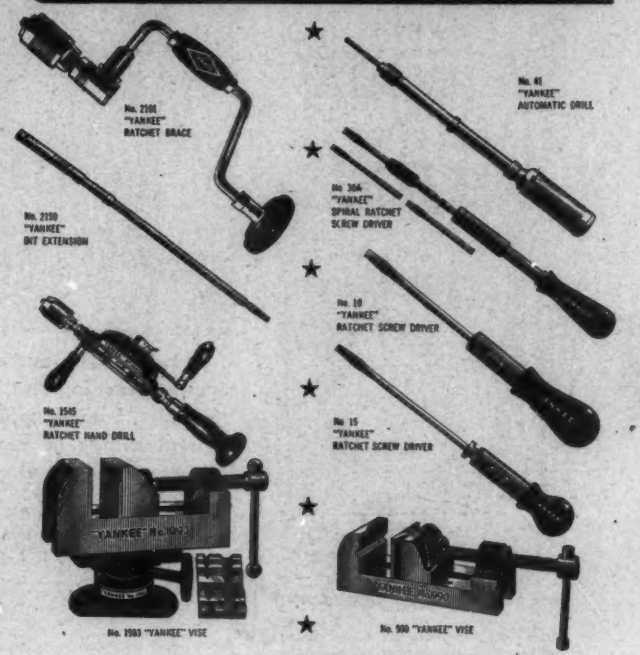
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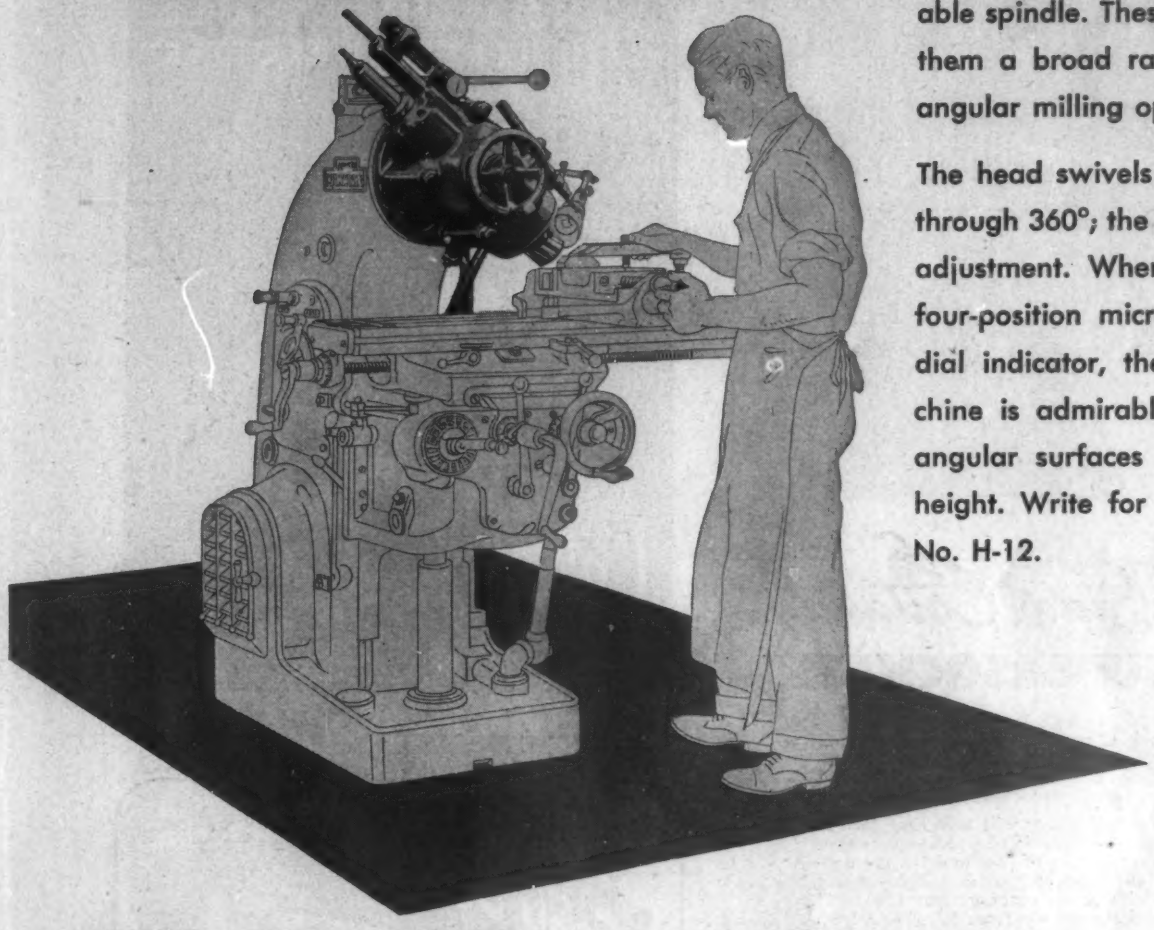
Range for Angular Milling Operations:



Vertical types of Models 1H and 2HL Milwaukee Milling Machines are designed with a swivel head and adjustable spindle. These two features give them a broad range in the field of angular milling operations.

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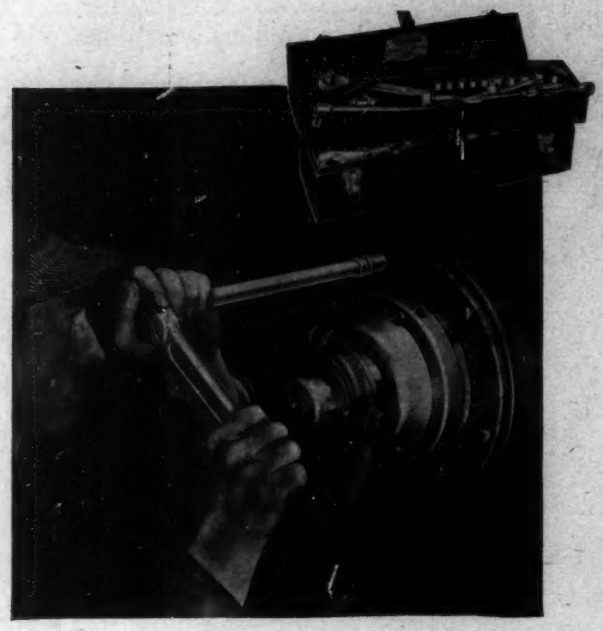

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11. Data on "C" Clamps.
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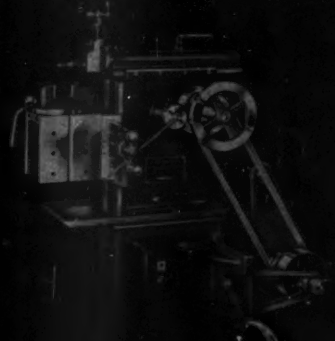

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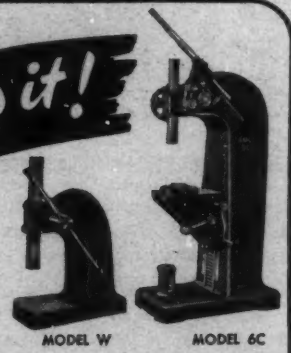

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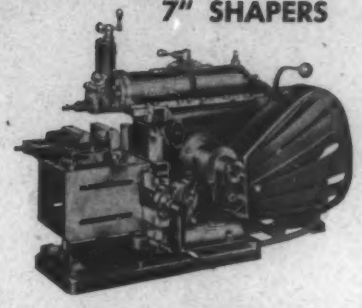

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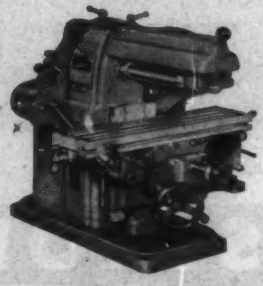

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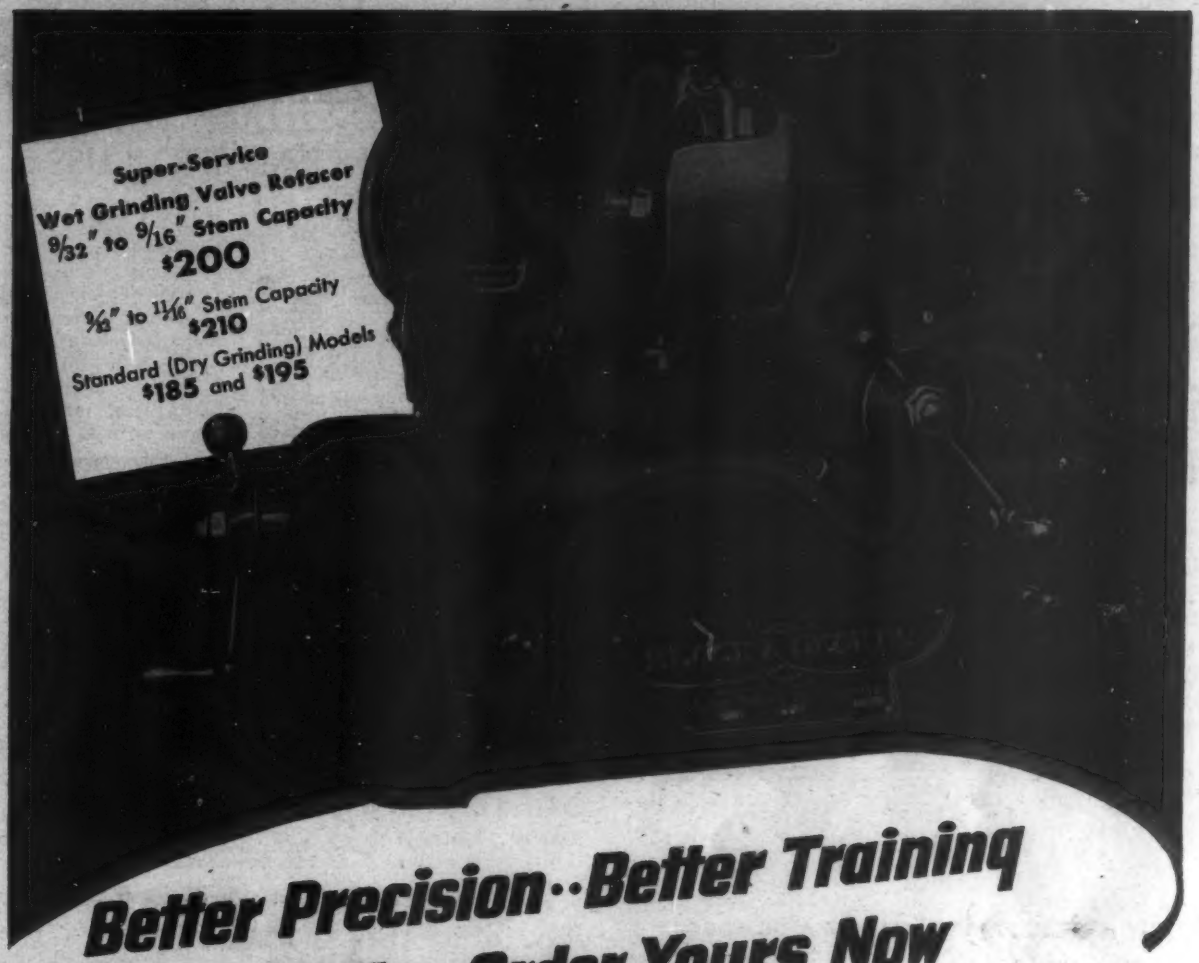

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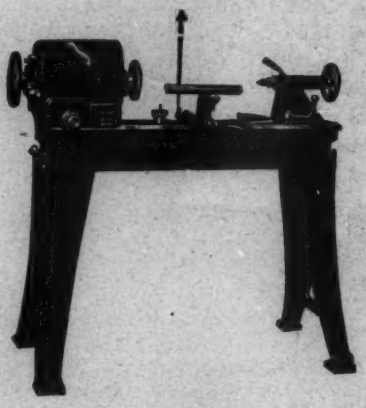

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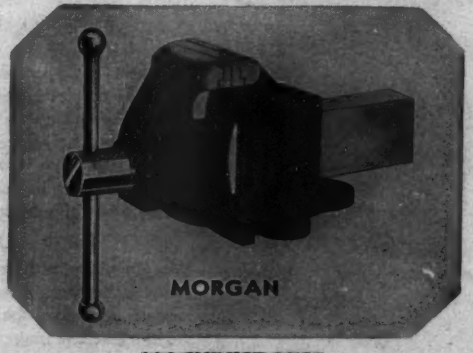

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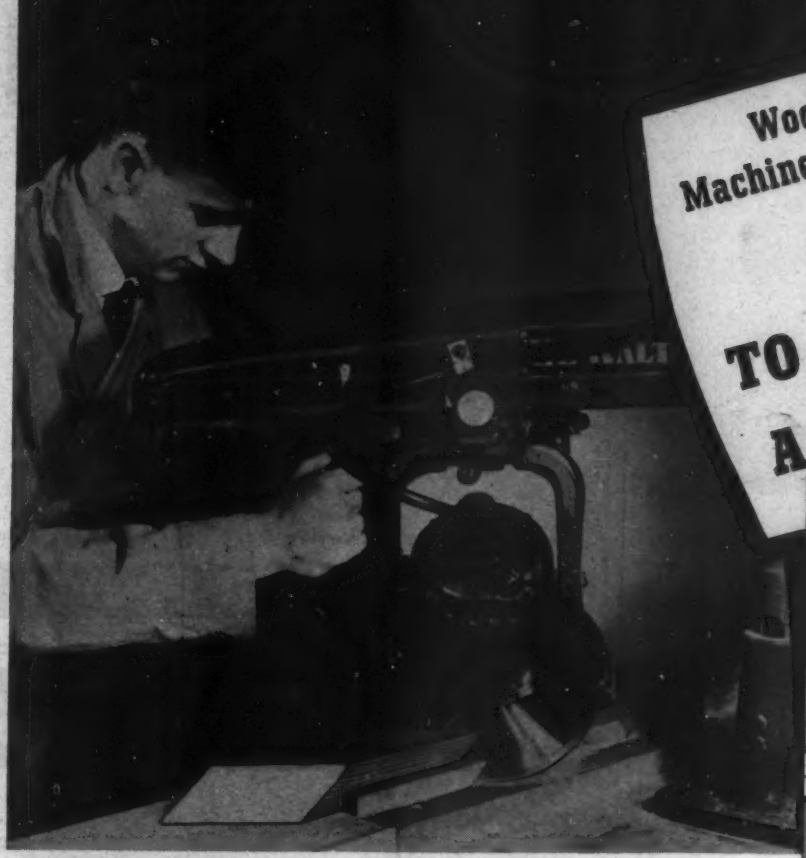

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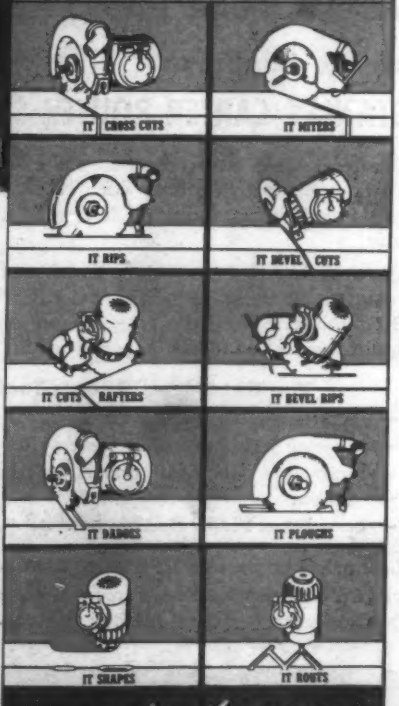

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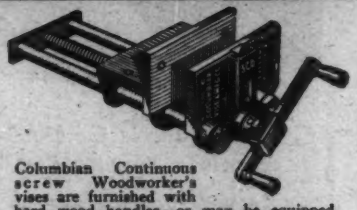

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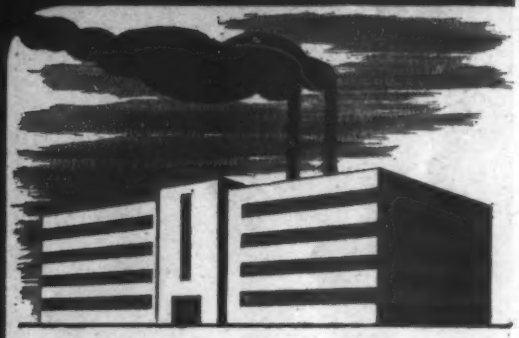

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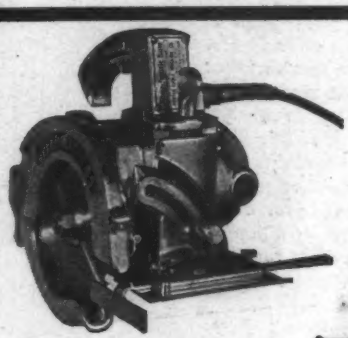

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Industrial Arts and Vocational Education

The authoritative source of information and guidance in organizing, planning, and equipping school shops.

READY FEBRUARY 15, 1946

The SHOP ANNUAL NUMBER summarizes the periodic progress in the field of industrial arts and vocational education, emphasizes the new developments ahead, presents through actual shop layouts and equipment lists, the best methods of accomplishment in the school shop field. The service of the SCHOOL SHOP ANNUAL NUMBER (regular March issue) of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION is

1. **It renders a comprehensive service promoting the introduction, progress, and expansion of industrial arts and vocational education.**

2. **It provides an authoritative source of information and guidance in organizing, planning, and equipping school shops.**

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Case History No. 187

Ebaloy is a tough alloy steel. "LALF" stands for Long Angle Lathe File. The two came to grips in a valve-manufacturing plant. In perhaps ninety cases out of a hundred this file will do a perfect job of lathe filing. But in this particular instance it didn't . . . it simply would not polish out Ebaloy valve stems smoothly.

A Nicholson service engineer had the solution. One way to do the job right, he explained, was to use the Long Angle Lathe File to remove the tool marks and then polish with a Mill Smooth File. A still better way, said he, was to use a Mill Second Cut* for the whole operation . . . because it could do a faster cutting job and at the same time produce a perfectly satisfactory finish.

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FOR EVERY PURPOSE

*Nicholson Mill Second Cut

As We Enter the Year 1946

Our troubled world has once more muddled through to a comparatively peaceful existence; hence, before conditions change, we hasten to wish all readers a most happy and prosperous new year.

It is true, America has paid heavily for the victory that has been gained over its enemies, and the future does not seem to be so rosy even yet, but we do have much to be thankful for. Our boys who had to live under such frightful conditions in both theaters of war, are returning. Thousands, of course, have been left behind never to return.

We welcome the living, and prayerfully remember those who have paid with their lives so that we may once more extend and feel the full import of the age-old wish — A Happy New Year!

Since this issue of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION will reach you before Christmas 1945, we combine with our felicitations for 1946, the heartfelt wish that Christmas, the feast of the Prince of Peace, be most joyous and happy for you and yours.

This Month's Cover

The cut for this month's cover picture was made from a Board of Education photograph submitted by Dr. Louis V. Newkirk, director of the bureau of industrial arts, Chicago, Ill.

It shows students engaged in the study of auto mechanics in one of the industrial-arts laboratories in the Chicago school system.

Christmas Seals to Fight Tuberculosis Are On Sale from Thanksgiving Day 'till Christmas.

Industrial Arts and Vocational Education

THE SHOP TEACHERS' PROFESSIONAL MAGAZINE
Published monthly except in July and August
THE BRUCE PUBLISHING COMPANY
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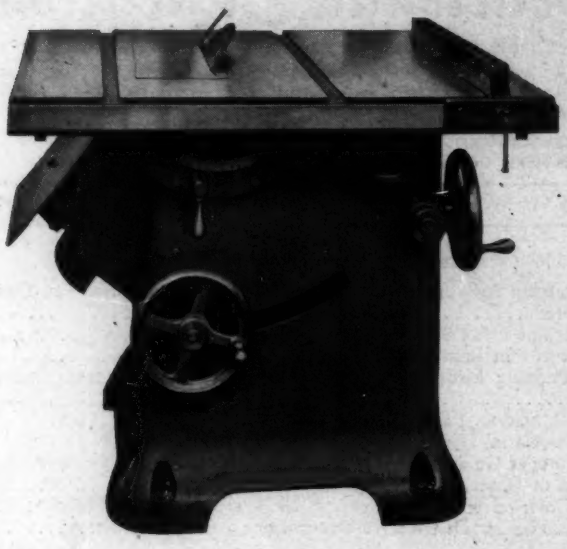

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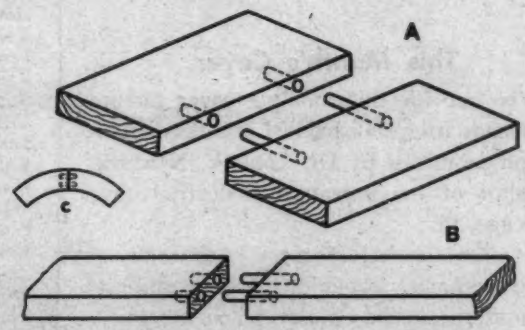


DOWEL JOINT

The edge-to-edge dowel joint (A) is used frequently to join boards together to make up a wide surface such as a table top. It is superior to the ordinary glue joint in that it provides greater strength, and tends to bring the boards together flush. When it is necessary to join wood in a strong, continuous piece, the end-to-end dowel joint (B) is frequently employed. It is also quite useful in uniting circular segments (C).

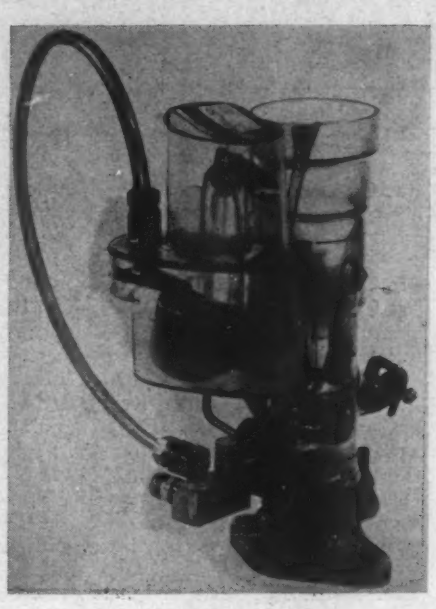
YATES-AMERICAN

The Army's Training Aids in Postwar Education

*Major Ralph C. Wenrich**
*Captain Daniel C. McNaughton***

Much has been said and written about the extent to which the army has incorporated the use of training aids in the tremendous task of training millions of men to fight and win battles. The army had to employ the best known training methods in order to accomplish its mission — to build, in a hurry, a fighting force of effectively trained men with which to defeat the well-disciplined forces of the enemy nations. The army has originated relatively few innovations in teaching techniques. Under the impetus of the national emergency, and with almost complete freedom from educational tradition, it was possible however for the army to develop to a very high degree of effectiveness many techniques of instruction which had long been known to civilian education. This work was accomplished to a great extent through the drawing in to the War Department and to various training centers large numbers of outstanding civilian educators, put them in uniform, and have them serve their country in the work they know best — training.

*Director, Reconditioning Division, Camp Carson Convalescent Hospital, Camp Carson, Colo.
**Chief, General Education Section, Educational Reconditioning Branch, Camp Carson Convalescent Hospital, Camp Carson, Colo.

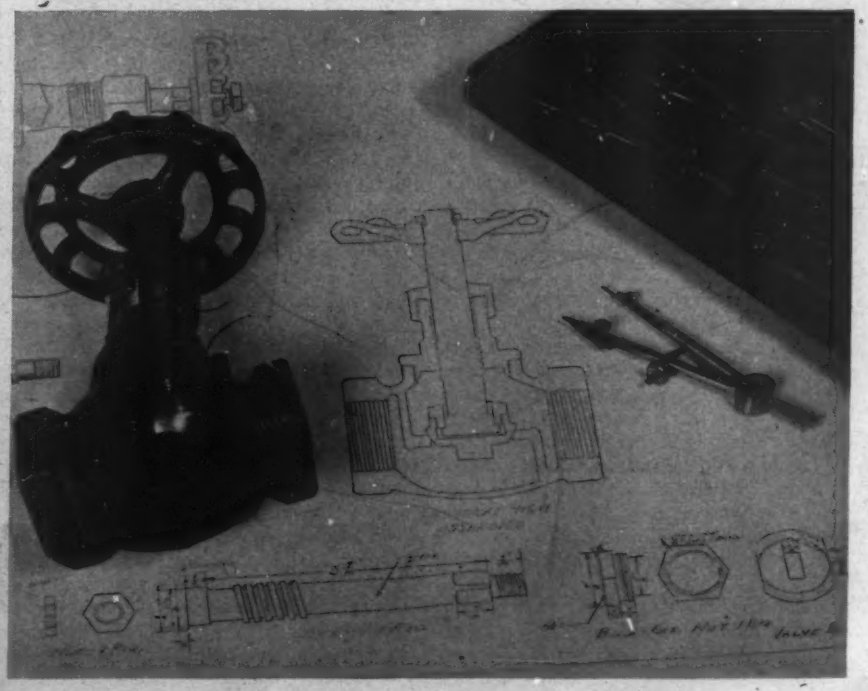


A carburetor built of transparent plastics

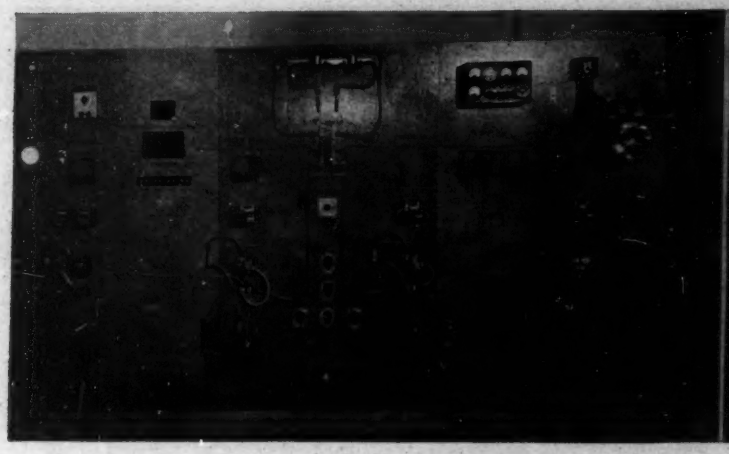
Time was the most important factor when Japan struck at Pearl Harbor. Men had to be taught skills and given attitudes quite different from those emphasized for peaceful civilian living. It had to be done in a short time, and skills had to be thoroughly mastered. It was a matter of life or death. Men from all walks of life had to be able to grasp this training. Their abilities, academic backgrounds, and occupational histories varied widely. It was necessary to make the training procedures of such a nature that the men who could not learn readily from the spoken or written word might progress as rapidly as those whose verbal understandings were more highly developed. In order to accomplish this kind of training the army found it necessary to rely heavily upon training aids.

Although geared to war needs and provided with certain incentives not present in civilian life, army training resembles, in general, the vocational training given in civilian life. It was necessary to develop skills in using tools and simple mechanical contrivances. In more advanced stages of training, men had to learn a wide variety of mechanical and electrical trades which closely paralleled civilian occupations. The army's requirements included such trades as motor vehicle mechanics, machinists, radio repairmen, plumbers, sheet-metal workers, instrument repairmen, electrical specialists, tire rebuilders, and welders, to name only a few.

Postwar civilian education will be remiss if it fails to profit from the experience of the army. Too often one hears the remark "The schools of the nation could do all the army has done if they had the funds." It is true that funds are not generally available to individual school systems to develop costly training films and elaborate, specially constructed devices. However most of the best training aids used by the army were not costly pieces of apparatus. They are simple devices designed and built at local installations at a very nominal cost. In most cases these devices consisted of an idea plus a bit of energy, a can of paint and a few pieces of wood or metal. The vocational schools of the nation have in the past recognized the values of training aids but have been somewhat limited by a lack of understanding of the special benefits to be derived from the use of such aids and a failure, in many cases, of instructors to bring their ingenuity to bear on the construction of these



Cut-a-way models help make training effective



Panels serve to simplify intricate processes

Training films help to make instruction effective

valuable adjuncts to training. In some cases training aids have been regarded as playthings not absolutely essential to good instruction. In other instances, they have been considered as substitutes for effective teaching. Neither of these attitudes will result in effective use of instructional aids. Well-chosen and well-constructed training aids, when made an integral part of good teaching, will result in a marked increase in the effectiveness of learning, both in vocational shops and academic classrooms.

Training aids, in the final analysis can be no better than the planning that goes into their construction. It is no more possible to produce an effective training aid without careful planning than it is to obtain the desired results from an unplanned lesson. Therefore, the training aid should be planned as an integral part of the lesson, and be constructed to fit the lesson.

In the army's use of the term, all devices employed as an adjunct to training are called training aids. Among them are the actual pieces of equipment to be studied, cutaways, scale models, operating models, schematic drawings, exploded views, diagrams, charts, animated films, training films, film strips, mock ups, sand tables, terrain models, photographs and maps. In addition to the devices listed, the army made wide use of blackboards, shadow boxes, individual projection devices, display cases, and opaque projectors. In passing, mention should be made of another effective teaching device, a well-illustrated, clearly written text or workbook. Teachers should insist upon this type of book; publishers will furnish them if teachers demand them.

The general aim was, wherever possible, to replace the spoken or written work with a training aid which would appeal to as many of the senses as possible. In many cases, a cleverly designed working model, chart, or diagram would replace hours of tedious explanation.

When considering training aids most teachers are inclined to think only of films, film strips, or slides. It is true that the army has used these aids to a considerable extent; civilian schools can use them just as effectively if they are well made and constructively related to the subject to be taught. The production of this type of training aid should be left to commercial concerns or to the U. S. Office of Education. They are too costly for production by local schools. Many good training films were prepared and distributed for use in the War Production Training Program.

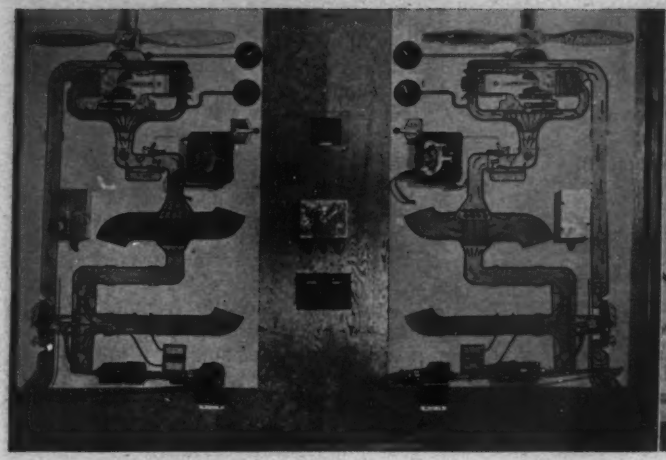
Other excellent training aids can, however, be made by the instructor or, in the case of large city systems, by a staff of specialists employed for this purpose. Charts, maps, posters, mechanical aids, models, and mock ups are examples of training devices which may be prepared locally. It is in this area that the schools have done very little.

It will probably be helpful to mention a few of the outstanding examples in which training aids were used to accomplish an instructional job which would have been almost impossible without them. In the servicing and repair of aircraft it was found that when the student was confronted with the maze of cables, controls, electric wiring and hydraulic lines which are installed in a large airplane, he would usually throw up his hands in despair of ever being able to understand the various parts. The army solved this problem by using a series of mock ups, each one a replica of an airplane fuselage. In one of these would be installed only the electric wiring, in another the hydraulic system, etc., so that each system could be studied in its relationship to the airplane as a whole, without the confusion resulting from the presence of the other systems. On nearby tables would be placed working models of various apparatus pertaining to the particular system being studied, so that by the operation of a simple device the functioning of every part might be readily understood.

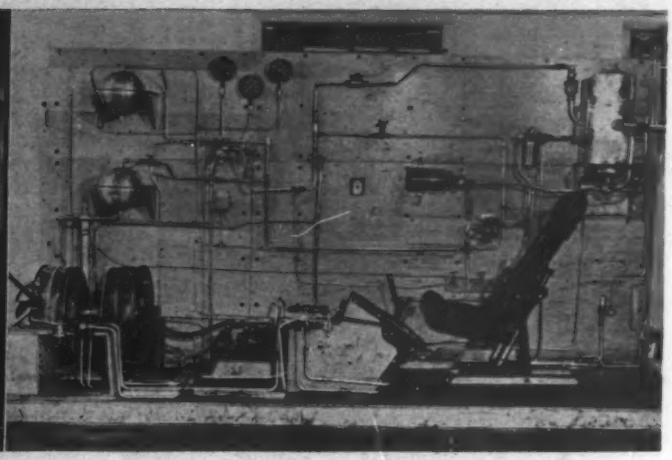
Much use was also made of transparent working models of various devices, such as carburetors, machine guns, magnetos, etc., so that the operation of ordinary invisible parts might be seen clearly. For training in aircraft gunnery, celestial navigation, and instrument flying, very elaborate training aids were constructed which would reproduce exact conditions encountered during flying, and which would save many hours of operation in actual aircraft, with a considerable saving in time and fuel. Soldiers concerned with transportation and supply were able to get a grasp of the many factors involved through the use of models of various types of supply installations, complete with trains, docks, loading platforms, supply dumps, and depots, as well as scale models of warehouses, ships' holds, and cargo airplanes. By working out a series of supply problems in miniature, the men were much better able to perform their duties than would have been the case if they had not had such training.

Civilian vocational schools have an excellent opportunity to capitalize on the experience gained in Army education through a more extensive use of various types of training aids. One of the chief benefits to be derived is in vitalizing education. Where carefully selected training aids are used as an integral part of education, a more complete grasp of the operations and principles involved is obtained and the learning is more apt to be retained. A simple example will demonstrate this fact. A motorist who receives only verbal instructions on how to reach a house located in another section of the city, or a farm some distance away, is apt to become confused as to the nature of his turnings and distances, even if he remembers the order in which they occur. If, however, he is given a rough sketch or a diagram, he gets to his destination much more easily and can probably find his way back again with little difficulty. Vocational education is sometimes criticized from the standpoint that many of the men learn how to do a sequence of operations but lack the knowledge of the theory behind what they do or what happens inside a certain machine or device when the operation is performed. The use of training aids will tend to increase the amount of understanding the student has of the functioning of many devices which he may be studying.

Another important outcome of making education more vital and interesting is



Diagrammatic charts supplemented by actual equipment



Functional panels demonstrate the theory of hydraulics

that the student will tend to stay in school longer and thus receive more vocational, related, and general education, which will result in personal advantages to the man, as well as reacting to the ultimate advantage of the trade which he will enter. In all vocational education little difficulty is usually encountered in keeping the student interested when he is actually using machine tools or working with actual materials. These things have sufficient inherent interest for most men that a high degree of enthusiasm can easily be maintained. However, in the study of fundamental theory and related education there is often a lack of enthusiasm which is difficult to overcome, since the student does not always see the relationship which this type of training will have on his achievement of the ultimate goal. It is here that training aids will prove especially useful through making this part of the program equally fascinating, and keeping the men going forward at a steady high rate of progress.

One of the criticisms voiced by the opponents of vocational education is that the schedule of a vocational student is crowded with the *practical* subjects so that little time is available for the cultural subjects. With the effective use of visual aids, the training skills can be accomplished in much less time than would be otherwise possible, leaving sufficient time for the cultural and general subjects which should be a part of the vocational student's curriculum.

In the case of vocational education for adults, it is particularly important that the time factor be considered. The more mature student is not content to spend an unnecessary amount of time in preparation for future employment. This is especially true of the veteran whose establishment in a life's work has already been delayed by several years due to the war. Schools can accelerate the training for this group with the use of visual aids without sacrificing thoroughness or the elimination of instructional units.

Time is an important factor in all things we do. If trade training is provided in a leisurely fashion, the student is inclined to develop an undesirable attitude toward time which will adversely affect his potential employment prospects. A student should be made to feel, at all times, that the job must be accomplished in the minimum amount of time. This concept can be best given by exemplification in the training program.

In addition to saving the time of students, the effective use of visual aids will result in the more economical use of training facilities, since a greater number of students can be trained in the same shops and with the same equipment during any given period. This is an important factor in view of restricted school budgets and unavailability of certain items of equipment.

The army has used training aids extensively in order to provide the most thorough training in the shortest possible time. The demands which will be made on vocational schools in the future will require the same thoroughness of instruction and consideration of the time element. If postwar vocational training is to assume its proper place in the educational and industrial world of the future, it must incorporate all methods found to be effective in wartime instruction.

Good Shop Teaching is Not Enough

*Don R. McMahill**

TIPS — on Improved Public Relations

Has your experience at faculty meetings been pleasant and inspiring? Or have you given your time grudgingly to the details of managing school affairs?

Such matters as revising the curriculum, arranging school schedules, adjusting the grade card, and building up vocational guidance are, indeed, a very necessary part of this business of instruction. Perhaps it is true, however, that the shopman especially would much prefer to be back at his machine or drawing board. The purpose of this article is to provide a new attitude for such instructors, a new point of view which may make the traditional meeting of faculty members more worth while and more important.

There is no successful industry or business in operation today which does not give considered attention to the comparatively new field of public relations. Owners have observed others go through the spirit-breaking process of losing their businesses because of poor public relations. They have adopted the techniques of others who have been successful. Analysis indicates every time that the factor which decides the difference between success and failure is, in a large majority of cases, that of improved relations with the public.

What is public relations? What does it have for public school teachers?

Someone has said that it is merely a lot of little things, trivial matters, but that the sum of the parts equals the attitude of the public mind.

What more could the public school teacher ask than for a supporting attitude on the part of the public?

Spoken Word Important

This evening's newspaper contains, in its Public Pulse column, a letter from an irritated citizen who has been "dressed

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down" without reason by one of the city's policemen. Readers will recall instances when they, too, have been "dressed down" by the police. What chance do the police, then, have for gaining a slight increase in wages — when the public mind sees this opportunity for vengeance?

All the good and kindly spoken words of a majority of the police force have been canceled by this triviality.

When did you last speak kindly to one of your students? Or to one of the school patrons?

And when did you last speak harshly?

It all adds up to the same thing.

The Public Can Read

A vocational supervisor from a near-by city last night told us of his remarkable success in obtaining several thousand dollars' worth of surplus government machinery.

"I happen to know that your supervisor here was slow to get started after that material. It would be quite a feather in my cap to expose him through the press and radio — but it wouldn't do your schools any good."

This man was more than a gentleman. He was public relations minded — not only for his own community, which is hundreds of miles away, but for the entire cause of public schools everywhere. He didn't think that anything which might discredit the schools should appear in print or be broadcast over the radio.

Shop Accidents

How often have we heard this excuse after an accident has happened?

"The boy was not following instructions."

Or, perhaps, this one:

"He had taken off the safety guard."

Such excuses or alibis are of no value. The lad has been hurt. He has been hurt at school. Logically, the school has hurt him. That is the way the public mind works.

How much better if the instructor were to give just an extra ounce of energy, *before the accident,* to his duty — his responsibility!

Honestly, now. Would your last three shop accidents have happened if you had been strictly on the job? Or if your assignment had been reasonable enough to permit experienced supervision?

Civic Powers

When Omaha's Technical High School first opened the doors of its present building in 1923, the public was much agog. Here, according to the press, was a streamlined affair indeed. The carpentry shop was large enough so that a full-sized bungalow could be built inside — and moved to the owner's lot anywhere in the city.

The auto-mechanic's shop would be able to service cars from top to bottom. The printing shop was constructed for production of all school printed matter in addition to the school newspapers.

Here was a wonderful school. And what happened?

First there were objections from the local union of carpenters. The schoolboys might keep several men out of work.

Next there were objections to the auto-mechanics shop. Garagemen called to protest this undertaking of work away from their businesses.

The typographical union made no open protest that has been recorded, but several job shop operators did register their disapproval. They would lose the Parent-Teacher Association contracts and similar paid matter!

These are typical of what must occur in every community in connection with the shop courses. How have these problems been solved? Has your own school carried on a program of enlightenment? Just what has been done to win the friendship of these civic powers who fear "child labor" in competition?

Only a few suggestions are in order here. Shop teachers might as well become better acquainted with the men who are to accept the high school graduate as an employee. The system of co-ordinating, brought on by the war, has provided an excellent opportunity for this job of building friendship.

The labor union problem is still unique in each community. Where membership is an accepted thing, shop teachers should not hesitate to join their trade-union and take an active part in all union activities. Where "open" shops exist, the instructor may have to compromise — if he cares to hold his job. (Such "open" communities do not have unions of sufficient strength to remove the instructor; the school-board members will give you advice in this choice.)

Membership in various civic clubs is of great value — regardless of the labor union issue. Find a place for yourself on the Community Chest Board, the Red Cross Council, or the Veteran's Aid body. Do something to add to the value of these groups — and they will remember that here was a school teacher who finally became civic minded!

Supply Publicity

Your school newspaper has young reporters who see your shop activities with a fresh eye. They will ask you no end of questions. And they should have the answers — the explanations given in a friendly, helpful manner.

That young writer has a way of getting his human interest stories into the city paper and into the radio stations. He needs your counsel and your advice.

What's more — you need the publicity he can give you, and that's why it must be absolutely correct information.

He won't mind much if you ask him to let you see the pictures and the story before he turns them in for the school paper, or the city newspaper and city radio station. He'll understand that you are just trying to save him tragedy of incorrect facts.

Build your public relations program along all lines — not as a self-seeker — but rather as a professional worker. You will be doing the public schools of the nation a good turn, and your own task may be somewhat easier as the years roll on.

Perhaps the greatest hindrance to the support of any public school program today is the teacher who permits himself to become just so much dead timber. He withdraws into his shop — like a turtle in its shell. He is first to snap when anyone mentions salary cut or a slash in funds for materials. But he never gives a thought to the all-important detail of sound public relations.

How many of us does that final paragraph describe?

A Grading System That Improves Students' Work

*L. Clark Close**

Many teachers believe that from an educational point of view the time spent in tedious detail of grading students' daily work is not justified. If all that a system of grading daily work accomplishes is to give the few superior students a feeling of superiority, the majority a secure feeling that they are doing all right, the poor students a feeling of humiliation, then this belief is well founded.

Most systems of grading fail to improve student work because no definite way is set up to make a student aware of specific ways in which he can improve his work in the future. A brief red penciled note, "Improve lettering," on a student's drawing will not prevent the average student from doing a bad job of lettering on his next drawing. He is not likely to know just what is wrong, and is less likely to refer to the lettering copy in his book and benefit from it.

In the mechanical drawing department at Washington High School in Sioux Falls, South Dak., we have felt the need of individualizing both instruction and grading for beginning students. We have tried to help those students who fail to acquire proper techniques from mass instruction and demonstrations.

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The method explained here, we find, has been highly successful in raising the average quality of work turned in by these students. When a student finishes a drawing, he comes to the instructor — or better still, calls the instructor to his desk — for a brief student-teacher conference over the drawing he has just completed.

LINEWORK	.....
ACCURACY	.....
DIMENSIONING	.....
LETTERING	.....
FINAL GRADE	.....

Fig. 1

The instructor stamps the form shown in Figure 1 on a convenient space on the drawing. Then the student's linework is discussed, the faults, which might be anything from too light an outline to poorly formed corners, are pointed out. Whenever it seems desirable, the instructor demonstrates on the student's own drawing how to get the desired results. The student's grade for his linework is then entered in the proper place. In order to shorten the conference time, grading of *accuracy* may be omitted during this conference and done outside of class. We always discuss *dimensioning* and *lettering* with the boy, grading him on these while he is present.

We have found that the use of this rubber stamp, which we had made at a local shop, not only speeds up and systematizes teacher grading, but also forcefully calls the attention of the student to the relationship between poor work on any part of his drawing and his final grade for the drawing.

It might be suspected that this method would be impractical in large classes. This, however, is not the case. Our beginning classes usually have an enrollment of 30 students. By careful class management there usually is a sufficient spread to prevent the development of a bottle neck. When several students happen to finish at about the same time, the teacher will either consult with them in a group or ask some to lay their drawings aside and start the next assignment. The teacher can call these students back for a conference as his time permits.

We have found that our best and most effective teaching is done in these student-teacher conferences. We, therefore, feel well repaid for the extra work that this method entails.

This same method of grading may be adapted to fit almost any school subject.

The Teacher Training Institution and Postwar Industrial Education

*S. Lewis Land**

The teacher trainer in industrial education has, as a primary responsibility, the recruitment and the training of an adequate number of trained teachers, supervisors, co-ordinators, and administrators in the fields of industrial arts and vocational education. It is not necessary to explain why it has not been possible to do this during the war period. In many fields, because of the newness of the program, there was an inadequate supply even before the beginning of the war.

The Need for Reliable Research

It is the further responsibility of the teacher-training institution to initiate, encourage, sponsor, and conduct needed research in industrial arts and vocational education. Studies in industrial education, conducted by our teacher-training institutions, should and do have practical significance in the development, conduct, and administration of programs of industrial arts and vocational education. Brief reference will be made to several important problems which need study, some of which are receiving attention either by staff members or students, or by representatives of the teacher-training institutions in collaboration with state department staffs and local school administrators.

Determining the Numbers to Be Trained

One reason for the lack of an adequate number of trained teachers in some fields has been the lack of adequate information as to the number needed. This suggests, therefore, the necessity of a careful study of industrial trends to determine what new fields should be included in industrial-teacher-training programs. In most of our skilled trade fields there is an apprenticeship period of from two to five years. In most of these fields our vocational schools include provision for training programs on a secondary school level of from two to four years. Our teacher-training program likewise includes a period of four years. Consequently, it is necessary for us to anticipate the demands of industry from 8 to 12 years in advance of the actual time mechanics will be needed.

The difficulties encountered in carrying out this responsibility are clearly recognized. It is recognized that mistakes will be made because wars and periods of depression cannot be predicted with any degree of accuracy.

There were no reliable data, for instance, on which it could be determined that such a large number of aircraft workers would be needed with the beginning of our war-production program in 1940. Prior to that time many of our aircraft plants had been recruiting workers from the graduates of four-year vocational high schools. The demand was so great in 1940 that jobs in the aircraft plants were broken down into specialties, and instead of employing an all-round aircraft mechanic there was employed an aircraft sheet-metal worker, an assembler, a welder, or other specialist. Beginning in 1940 these specialists were given a training program of 10 weeks. By 1941 this had been reduced to 6 weeks; later to 4 weeks; later to 3 weeks; and for the past 2 years mechanics have been recruited for some of the aircraft plants, as well as for other war-production plants, placed on the pay roll of the employing company, and given specialized training in a one-week training program.

In the development of plans for postwar training programs let us profit by our experience following World War I. It will be recalled, for instance, that we experienced a severe shortage of mechanics in the construction industry in the years following World War I.

In nearly all of the construction trades there is an apprenticeship period ranging in length from two to five years. Consequently in the planning of local vocational programs in the construction field it is necessary to anticipate the personnel needs of the construction industry from two to five years in advance of the time when mechanics will be needed.

In addition to the new residential construction program there is a large market for repair and alteration of existing structures which has accumulated during the war years.

Dr. Wilson Compton estimated in an article which appeared in a recent issue of the *New York Times* that the new residential construction program alone will call for the employment during the next ten years of at least 2,000,000 building mechanics.

According to the Bureau of the Census we had employed in 1940 in the 15 major building trades in all branches of the construction industry 2,216,000 mechanics. This number has, of course, been greatly depleted during the war years.

It is important, therefore, that local

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programs of vocational education should be geared to meet these new demands for skilled mechanics in the construction industry.

The personnel needs in the construction industry are cited merely because they are typical of the needs which exist in many other fields. The transition from wartime to peacetime employment calls for an appraisal of our offerings in vocational schools and the gearing of our program to meet the immediate postwar demands for skilled workers in all fields of employment.

Some of the employment procedures developed in the war program will be found to be preferable to the old peacetime procedures. We may continue in the postwar years to employ specialists in certain phases of industry, but the need for all-round mechanics will be greater in the long range peacetime production program than has been the case in the war-production program. It will be the responsibility of the teacher-training institution to follow these trends in postwar production and to shape its industrial teacher-training program in line with these industrial trends.

The Selection of Candidates for Professional Training

It will continue to be the responsibility of the teacher-training institution to develop, perfect, and use more adequate selection procedures in the induction of candidates into professional teacher education programs. Some reliable selection procedures have already been developed and are in effect in some of our institutions. In Pennsylvania the three teacher-training institutions serve as agents of the department of public instruction in qualifying candidates who apply for admission to professional preparation leading to certification to teach shop subjects. The selection techniques at The Pennsylvania State College include a 4-hour trade performance test administered by a competent examiner, a 3-hour trade theory examination, a psychological examination, an English test, and an interview by a competent committee of three.

Needed Expansion of Training Programs

In the past there have been developed, quite adequately, training programs in the large and medium-sized cities for the highly skilled trades. We have reached the point now where we need to expand our program upward to meet the needs in the vocational-technical field and downward to meet the needs in the semiskilled and unskilled fields.

Vocational Technical Education

Considerable progress has been made in the direction of developing our vocational technical program. A committee of the U. S. Office of Education has recently published a report of its studies on the national level. We need now to make further studies on the regional, state, and local level. Throughout last winter a committee made up of superintendents of schools, local vocational directors, and teacher trainers met at regular intervals in an effort to provide proper guidance of our activities in this state in the development of our vocational-technical program. The procedures employed in this study are typical of those which should exist in connection with much of our research work. In other words, much of our research work should be done in collaboration with other agencies on the federal, state, and local level. Research work conducted by teacher-training institutions within the ivy-covered walls of the college classroom too frequently lacks practical significance.

Area Vocational Schools

Another phase of our program of vocational education which needs careful study at this time is the question of adequate vocational-training opportunities for youth in our small communities and rural areas. Legislation, sponsored by the American Vocational Association, before Congress at the present time, earmarks $24,000,000 to finance area vocational schools. In the practical development of our program of area vocational schools we will find that some of our vocational schools, operated by local boards of education, need to be expanded to serve a larger area. In other instances we will find that some areas must be "developed from scratch." A great many factors must be carefully studied in connection with the area school, including present and possible future employment opportunities, population trends, transportation facilities, and industrial developments.

Immediate Problems Demanding Solution

Perhaps the two most important immediate problems with which we are faced today are the education and training of demobilized service personnel and the retraining of warworkers for peacetime activities.

The Training of Demobilized Service Personnel

The education and training of demobilized service personnel is a problem with which education in general is concerned. It is true that large numbers of returning servicemen are entering industrial employment or training programs leading to industrial employment. Large numbers, however, are entering upon an educational career on all levels, ranging from the secondary school through the university. It is estimated that by the end of the current year 1,000,000 servicemen will be enrolled in our high schools and colleges under the provisions of the G.I. Bill-of-rights.

Large numbers of servicemen will not return to the jobs they left. A survey of 700 servicemen in one county, made recently under the auspices of the Committee for Economic Development of the Chamber of Commerce of the United States, revealed that 62 per cent of the servicemen in that group will desire to change to some other job when they return to civilian life. In some cases these men have received training while in the service which will equip them for the new job they desire to undertake. In many other cases they will need retraining for the new job they desire. Adequate and reliable guidance, thorough and complete training, and assistance in placement is the specific responsibility of the public school.

Retraining Worworkers for Peacetime Activities

Just as there were problems in 1940–41 in the training of large numbers of workers for service in war-production plants, so there are problems today in the retraining of these same workers for peacetime work. Cancellation of war contracts is responsible now for thousands of men being laid off every day. Executives in war plants in one city where there have been employed in recent years approximately 100,000 men and women in aircraft work estimate that the peace time program in these same aircraft plants will call for the employment of from 9000 to 10,000 workers. This does not mean that the additional 90,000 workers will be out of employment for any long period of time. It does not mean that the entire 90,000 will need to be retrained for another job. Some of them will be able to utilize the same skills which they have acquired for work in the aircraft plants in new jobs which they will secure in automobile manufacturing plants and other peacetime production. Some, however, will need retraining for available jobs at which they will be employed.

It will be the responsibility of the public school to offer adequate guidance, training, and placement assistance to these thousands of displaced workers. It will likewise be the responsibility of the teacher-training institutions with the assistance of the Federal Office of Education and state departments of education to provide adequate assistance to the public schools in the satisfactory discharge of their responsibilities in this connection.

Training in Accident Prevention

In the reconversion from wartime to peacetime employment, industry will be faced with the problem of accident prevention. The postwar period will present new problems and new opportunities in accident prevention to industry and to schools. Industry itself has been very conscious of its responsibility in this connection during the war years. The National Safety Council revealed recently that in the last prewar year of 1941, 18,000 workers were killed, compared with 17,500 workers killed in the war year of 1944. The reduction of 500 is encouraging and the schools have had no small part in this improved record. It will continue to be the responsibility of the schools to reduce still further this all too high accident rate in industry.

The Improvement of Instruction

Not the least of the responsibilities of the teacher-training institution in the fu-

ture is its responsibility, along with those engaged in the field of industrial education on both a state and local level, to improve instruction. Teacher trainers are attacking this problem on a national basis through its national organization, The National Association of Industrial Teacher Trainers. It has the co-operation of another similar national organization, The National Association of State Supervisors of Industrial Education. Both of these groups recognize the function and responsibility of every agency on both a state and local level in the program for the improvement of instruction. It is our desire to more clearly define the respective responsibilities of each agency and to encourage each agency to accept its responsibility in this important undertaking.

The Adequate Promotion of Vocational Education

The teacher-training institution recognizes its responsibility in helping local school officials to more adequately and soundly promote local programs of vocational education. One of the more important, yet sometimes least recognized, responsibilities of the local vocational director is the adequate and sound promotion of his program. All too frequently he fails to adequately promote his program because he himself does not have a clear-cut picture of what he accomplishes for industry.

A survey of 90 war plants made recently reveals that the schools have been a very real help to industry (1) in the reduction of time required to adapt workers to production, (2) in the maximum utilization of available personnel, (3) in the saving of the time of foremen devoted to the training and breaking in of green workers, (4) in the reduction of the use of production machines for training, (5) in the reduction of loss of tools and machines due to breakage and poor workmanship, (6) in the reduction of the accident rate, (7) in the reduction of labor turnover, and (8) in the reduction of absenteeism.

Specifically, these facts, expressed by employment managers, personnel directors, and other plant executives, point conclusively to the value of training programs in vocational schools.

Reduction of Time Required to Adapt Workers to Production. It was revealed that before the use of organized training these 90 plants were spending 4.05 months in adapting workers to production, as compared to 1.8 months after the use of organized training methods. In other words, 55 per cent of the time is saved through training in adapting workers to production.

The Maximum Utilization of Available Personnel. It was revealed that an average of 214.17 hours were saved per trainee through the training and upgrading of workers in supplementary courses.

Saving of Supervisory Time. It was revealed that before the use of organized training methods, foremen were spending 41.3 per cent of their time in training and breaking in green workers as compared with 14.3 per cent of their time after the use of organized training methods. In other words, there is a saving of 65 per cent of the supervisor's time through the use of organized training methods.

Reduction of the Use of Production Machines for Training. It was revealed that there was an average of 661.3 production machine hours per trainee saved through having training done in school shops rather than on production machinery in the plant.

Reduction in the Loss of Tools and Machines Due to Breakage and Poor Workmanship. It was revealed that there is a 9.5 per cent spoilage as a result of breakage and poor workmanship for the entire personnel in these 90 war plants, as compared to 2.5 per cent spoilage for trained workers employed in these plants. In other words there is a 73 per cent reduction in spoilage through organized training.

Accident Reduction. It was revealed that there was an average accident rate in these 90 war plants of 8.2 per cent for the entire personnel as compared with an average accident rate of 2.9 per cent for trained workers. In other words there is a 65 per cent accident reduction among pretrained workers.

Labor Turnover. It was revealed that there was an average labor turnover for the entire personnel of 32.01 per cent as compared to an average labor turnover of 16.75 per cent for trained workers. In other words there is a 47 per cent reduction in labor turnover among pretrained workers.

Absenteeism. It was revealed that there was an absenteeism rate of 6.6 per cent for the entire personnel as compared with an absenteeism of 4.1 per cent for trained workers. In other words there is a 38 per cent reduction in absenteeism among pretrained workers.

The development of data of this kind and assisting local vocational directors to develop similar data along with its proper use in the adequate promotion of vocational training programs is the responsibility of the teacher-training institutions.

The Responsibility of the Teacher-Training Institution

The teacher-training institution which merely conducts courses for the preparation of teachers, without regard to their adequate selection and placement and without regard to all of these other factors having to do with the development of our whole program of industrial education, is not meeting its responsibility. The teacher-training institution which concentrates all or a major portion of its effort on research problems on a theoretical and unrelated character is likewise not meeting its responsibility. The teacher-training institution which is measuring up to its obligation to the state and to young people is carefully selecting its students, carefully studying the conditions under which they will work, and is maintaining a consistent and continuous program of research on its own and in collaboration with other agencies on the federal, state, and local level. It is only through the acceptance of its responsibilities to fulfill this obligation that our program of vocational-industrial education can be adequately, soundly, and completely developed.

Printing and Motivation

*Paul D. Hahn**

That there can be no learning without motivation is now a recognized principle in education. There are two major factors in school achievement: intelligence on the one hand and motivation on the other. The intelligence of the pupil is his inherent capacity to learn while his motives are the forces that bring this capacity into action. It becomes, therefore, the printing teacher's task not only to make a study of the height and range of human possibilities but also to find out about the dynamic aspects of human nature. He must discover not only how the mind works but why, for motives are the springs of human action.

Sources of Motives

There are two sources of motives: (1) intrinsic motives, which are those that come from within the individual, and (2) extrinsic motives, which are those that are acquired as a result of environmental influences.

Intrinsic motives may be described as inward impelling urges or drives to action. Some of these may be primary desires which function because of some underlying physiological tissue condition within the body, such as, urges to satisfy hunger and thirst, sexual impulses, bodily activity, and the rest needs of the body. In addition to general tissue needs there are other desires of equal primacy, as the desire to seek pleasure and avoid pain, to satisfy curiosity, to distinguish oneself in some endeavor, and to seek self-expression through various channels of interest. Intrinsic motives, therefore, exist as an end in themselves.

Extrinsic motives are acquired desires that have been artifically introduced into an individual's life through some external force in his environment. Some of these acquired desires are: a pupil's desire for high marks, social approval, security, competition, and a vocation. Extrinsic motives, therefore, exist as a means to an end.

Definition of Motivation

The relating of school work to these dynamic forces is called motivation. Wil-

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son, in *The Motivation of School Work*, states that "motivation is that attack upon school work which seeks to make its task significant and purposeful to each child by relating them to his childish experiences, questions, problems, and desires." The pupil's work is motivated whenever he sees a real use in it, whenever it satisfies some need he feels, provides some value he wants, supplies some control he wishes to possess, or helps him to attain any definite longed for goal, near or remote.

Printing — An Ideal Subject for Motivation

Nature has indeed been generous to the subject of printing, for she has placed within it so many direct appeals to the inherent desires of the boy. In doing this she has given the printing teacher a big aid toward successful motivation. The printing equipment at once arouses the curiosity of the boy, who is not satisfied until he sees how and why it works. The appeal of printing to the mechanical desires of the boy is answered by the type, presswork, and paper cutting. It affords the necessary physical exercise to stimulate and balance the mental processes, developing the co-ordination of eye and muscle. It satisfies the boy's inherent desires for manipulation, construction, self-assertion, acquisition, and self-expression.

Intrinsic Motivation

The use of these inherent desires is the alert printing teacher's most direct method of approach to the motivation of his subject. Learning thus motivated by desires within the person himself is called intrinsic motivation. The use of inherent desires provides the most *natural* element in motivation because these forces function by themselves. The teacher's part consists in furnishing the best setting for their functioning, and of being careful of over-suppression.

Extrinsic Motivation

On the other hand, extrinsic motivation is a more complicated problem in the printshop because through this process learning is artificially introduced into the learner's life by some external force. It is learned under penalty or reward, actual or implied, and may be presented by the learner to show that he has accomplished the task imposed. It becomes the printing teacher's duty, therefore, to create an awareness of desires by purposely directing the desires of the pupil from a felt want to one that is as yet unfelt or only vaguely perceived.

The Boy vs. Subject Matter

This is far afield from the old system of education under which, if the pupil did not desire to learn, he was told to study anyhow, or to be punished if he did not. The mistake on the part of the teacher was in assuming that attention would arouse interest in the subject matter at hand. Today subject matter is thought of in terms of life experiences organized around the boy whose interests and real problems are the solution to the learning situations. This is not sugar coating education. It is merely presenting schoolwork in the most efficient, common-sense way, for if the teacher can get the boy to want to learn, he will get the whole attention of the boy in industrious application to the task that is before him, and thus minimize his own discipline problems.

A Living Print Shop

Through the relating of subject matter to the life of the boy, the print shop becomes life itself. The boy thinks of printing in terms of life experiences in a laboratory type of learning situation. Under this program his work is designed to teach him how to think in problem solving, instead of just doing printing jobs which have been prescribed and completely planned by the teacher. Laboratory problems are solved by the learner as he draws patterns from former learning and combines them into new patterns as solutions for a particular problem in hand. The teacher utilizes the boy's interests to launch each unit of work, but as the units unfold, the teacher skillfully devises activities and materials that will go infinitely beyond the initial interests, thus broadening both the interests and the life experiences of the learner. Under this process the print shop becomes not only child centered but also society centered as the printing units reach out and overlap the boundaries of other curricular subjects, and then go beyond the school horizon to bring into the shop methods and conditions of the modern industrial world.

Printing and Changing Society

The complexity of modern society presents many new conflicts and unusual situations for the youth of today. It should become the underlying purpose of a motivated printing program to stimulate and assist the boy in the solution of his individual and collective problems. Never before has there been more need for people to practice the art of thinking, and printing can best meet the challenge of changing conditions by offering the boy motivated activities that will give him the effective practice of this art. In addition, there are two pronounced trends in modern life: (1) the increased mechanization of life, and (2) increased leisure for more and more workers. These two factors should also condition the motivated activities of the print shop if this subject is to be adapted to the needs of present and future society.

With the increasing mechanization of life there is coming an increased demand for skilled craftsmanship. Industry still needs and will continue to need workers with manual skills, ingenuity, and inventiveness, trained in the fundamentals of scientific and mechanical principles. The printing teacher should motivate the activities of the boy so that he will come to realize that manipulative skill alone is not enough; that only when his skill is combined with art does he become a genuine craftsman.

Along with the needed emphasis on the industrial aspect of the problem, printing should be motivated so that it will make a definite contribution to the worthy use of leisure time by laying a foundation in the realm of hobbies.

Study Made of District of Columbia School Print Shops

In order to discover ways and means of putting the theory of motivation into actual practice a study was made of printing motivation in the 18 District of Columbia school print shops. Through personal observation, questionnaire forms, collection of materials, and personal conferences, the writer tabulated each teacher's ideas together with their shop accomplishments in printing motivation. This was a difficult task, for as yet no educational yardstick has been invented by means of which all the results of such teaching can be measured. No attempt was made to tabulate all the desirable habits, skills, attitudes, and appreciations that may have been developed as a result of a motivated program. Since there is neither time nor space to present all the splendid projects that were collected from each shop, only a brief summary of the results obtained through this study will be outlined throughout the remainder of this article.

Definite Goals

In this survey it was found that the District of Columbia printing teachers were unanimously of the opinion that the first step in putting across a vitally motivated program was the organization of the printing units toward definite goals of attainment for the following reasons: (1) gives the pupil a living purpose in his work, (2) establishes points to focus on and strive to attain, (3) gives a personal meaning to the pupil's progress in terms of his daily achievements, (4) makes clear the continuity of the subject matter as each assignment unfolds toward the desired end, (5) prepares the pupil for what is to come, (6) enables the pupil to get what he wants with the least expenditure of time and energy, (7) emphasizes the salient points of the lesson, and (8) satisfies the critical, analytical minds of the pupils as to the worth and value of each assignment.

Individual Differences

The underlying purpose of every motivated program is to get each pupil working up to the height of his capacity. Recognizing the truth of this fact and that all pupils have different capacities, the majority of the teachers recommended that the motivated units be adjusted to fit the needs of the individuals in the shop. Pupils of low I.Q. should be expected to accomplish the minimum essentials of the assignment while average and superior pupils should be required to cover the lesson in its entirety. The superior pupils should also be assigned additional work of more creative nature. In this way success or failure is made relative to ability, for with the completion of a task, within the zone of his ability, the pupil experiences a feeling of success.

Pupil Progress

All the teachers agreed that the pupil should be made conscious of his progress so that he may learn to diagnose his achievement in terms of success or failure and thus become his own severest critic. To accomplish this end the teachers recommended the use of progress record charts placed conspicuously in the shop so that each boy may be not only aware of his own record but also compare his record with those of his classmates. Other methods suggested were: individual progress records kept in scrap books, envelopes, or in combination job and information booklets, frequent comments on quality and quantity of work, personal conferences, promotions, and by grading each completed assignment. Of these methods the progress record charts appeared to be the most effective as they placed the record constantly before the boy and encouraged keener rivalry.

Emotional Incentives

In general, praise was found to be more effective with low I.Q. and average pupils while reproof appeared to get better results from superior pupils who were not working up to capacity. Praise at all times should be sincere. It is better to make some comment rather than none at all. Ridicule with a smile, keeping pupils after school, removal of special privileges, and assignment of unpopular shop tasks were found to be effective forms of negative motivation. Of these the weakest was judged to be that of keeping pupils after school.

Social Incentives

Competition was found to be an effective motivating force because it appeared to draw out all the boy's reserve energy in his attempt to surpass his own record and those of his classmates. It is encouraged in the shops by the use of honor rolls, blue ribbon rewards, displays, progress record charts, comments, rivalry in completion of setup jobs, use of name in printed jobs, granting of special privileges, and promotion to coveted positions in the shop, such as foreman, pressman, and the like.

Visual Aids

Visual aids were recognized as a help in motivating shop activities because they: (1) call into play more than one sense at a time, (2) clarify oral descriptions, (3) assist in imitation because processes are more quickly comprehended through eye than ear, (4) help the boy live through the situation, (5) help in the orientation of the boy with the industrial world.

Visual aids recommended for use were: blackboards, bulletin boards, charts or diagrams, pictures or photographs, displays or exhibits, motion pictures, excursions to printing plants, giant models, and progress record charts.

Pupil Drives

The interesting collection of motivated projects from each shop proved that the District of Columbia printing teachers were attempting to give their pupils plenty of opportunity for problem solving and the developing of a hobby interest. Self-expression was encouraged through pupil choice of such decorative projects as calendars, mottoes, placards, programs, book marks, and greeting cards. All these were based on pupil interest in a variety of subjects such as motion pictures, holidays, anniversaries, current events, and school affairs. Collecting products was encouraged by scrapbooks and exhibits. Curiosity, acquisition, entertaining, and fitting for a career were other major motivating drives.

Job Sheets

Job sheets were found to have the following advantages: (1) allow the pupil to work at his own individual rate of speed, (2) take care of individual differences, (3) develop resourceful thinking and reading, (4) give teacher extra time for individual instruction, (5) provide for clear organization of work, (6) are typical of trade practices, and (7) are especially helpful in large shop assignments.

Job sheets were found to have the following disadvantages: (1) may allow for too little pupil choice of problem, (2) may be difficult for boys of low I.Q. who lack the ability to follow written directions, (3) may become too stereotyped in form, (4) may substitute too much for the teacher, and (5) do not provide, as a rule, for an enriched program for superior pupils.

Regardless of their shortcomings and their need of constant revision, job sheets were found to have splendid motivating opportunities. This fact was graphically illustrated by one of the teachers who had the novel idea of organizing his printing units into adventurous job sheets. Printed in an arresting form on gaily colored cardboard, these job sheets were planned to lead from one adventure to another with the most exciting ones promised to the more enterprising printing explorers.

Shop Library

The shop library was regarded as a valuable motivating force for the following reasons: (1) motivates further study, (2) develops habit of looking up facts when the need arises, (3) aids pupils with reports and reference problems, (4) provides immediate answer to pupils' questions without lapse of time, (5) motivates necessity of keeping up with the trade, and (6) encourages reading habits for the better use of leisure time.

Production Work

Controlled production work was regarded as a helpful means of motivating the further activities of superior pupils because they enjoy working on jobs of commercial value. A heavy assignment of production work was frowned upon especially by the teachers having limited time schedule or pupils of low I.Q.

School Paper

The school paper was praised as an excellent motivating force because it: (1) gives the pupil an opportunity to serve his school community, (2) provides a rich field of creative jobs for superior pupils, (3) encourages competition for with its jobs go the honors of publicity, (4) furnishes an assortment of jobs and operations that appeal to every boy, and (5) develops a civic consciousness and school pride.

The Printing Teacher Himself

In conclusion it was found in all the shops studied that much of the success of a motivated printed program depended very definitely upon the teacher himself, upon his sympathy, his patience, and his understanding of human nature as well as upon the subject matter. The teacher is always an inestimable part of the total learning situation in shaping the purposes, ideals, and sentiments of his pupils, and through his example the pupil should learn informally those subtle spiritual qualities of a truly educated person. The teacher's personality inevitably affects the student.

The Skin and Industrial Hygiene

*Richard H. Behrens**

The importance of industrial hygiene to both industry and the worker was never so forcibly demonstrated as during the wartime when each man-hour of work was of the utmost importance. Large sums were spent by private and governmental agencies in an effort to improve the conditions under which the employee worked and lived. Not only was the physical condition of the plant brought to the highest standards demanded by good hygiene but the worker was provided with improved living conditions and with the best of medical attention at low cost.

However excellent the surroundings of the worker, both at work and at home, these efforts may come to nothing if he does not possess some rudimentary hygienic knowledge. For this reason the responsibility of the vocational teacher for emphasizing the hygienic aspects of all shop and industrial work has never been greater than now. It is common practice in school shop instruction to present most hygienic instruction as incidental to doing the job. Too often, under the ideal shop conditions which exist in many school shops, the satisfactory performance of the specific job causes the emphasis on learning the hygienic implications to be less than

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that demanded by actual industrial field work.

Because of the protective function of the skin its hygiene should form an important part of industrial hygiene instruction given the vocational student. Although this function of the skin is in general well understood by the industrial worker who uses gloves and other protective clothing freely, the dangers of skin injuries are increasing due to the average worker's ignorance of the effect of some of the newer chemical substances now in use, as well as the nature of the skin in its chemical and physiological reactions to them. In this paper an attempt has been made to present some of the essential material which might be incorporated in shop hygiene instruction for the vocational student.

The Skin

The skin forms the external covering of the body. It consists of two units, the outer portion called the epidermis and the underlying portion known as the dermis. The epidermis, or outer skin, functions largely as a protective covering and consists of five layers of cells. The outermost horny layer consists of interleaved flattened and hardened cells. Its thickness varies from the very thin skin of the eyelids and the lips, to the considerable and easily measurable thickness of that on the heel of the foot. The four layers of cells below this form transitional strata through which the basal living epidermic layers gradually change to the flattened outer horny layer. As a padding for the epidermis the derma below it consists largely of elastic fibrous tissue which contains a number of skin organs such as the fat and sweat glands, nerves, hair follicles, lymph vessels, and some fat cells.

Nature has thus provided the body with a tough, flexible covering which will adapt itself to a variety of bodily needs. It has the ability to thicken into callous when the skin is subjected to much mechanical attrition and it is well supplied with lubrication to protect it against chemical and bacterial damage. This lubrication consists of fats originating in fat glands emptying into the hair follicles. In this way not only the skin but the hair as well are kept supple and smooth. This natural skin fat also acts as a pro-vitamine and is partly reabsorbed from the skin by the body after irradiation by sunlight.

The sweat glands serve the primary function of body temperature control. Warmth stimulates the transfer of liquids from the blood capillaries to these glands which force it to the surface of the skin. Evaporation of this sweat abstracts heat from the body, thus cooling it. It also functions as a secondary organ of elimination.

Skin Hazards in Industry

The skin often suffers severe treatment in many trade and industrial occupations. The drying heat of the furnace, steam and chemical vapors, burning rays from the arc welder, chemicals in liquid and powder form are all capable of damaging the skin. The effect of such injuries along with those resulting from the constant handling of sharp or abrasive materials lay the skin open to bacterial infection.

Skin Chemistry

The skin is not a chemically inert material. It is capable of forming extremely complex chemical unions with a great variety of substances. Cosmetic and medical skin preparations are often compounded with due consideration to the reaction of the skin to their various ingredients. It is common knowledge that many oils and creams applied to the skin will bring about a softening of the epidermis and that substances like salt brine or acids will cause hardening and roughening of the epidermis if it comes in contact with it. The softening, roughening, or toughening of the skin is in each case the result of a chemical union of one of these agents with the skin. Nature has provided the skin with glands which secrete and pour upon the skin and hair natural fats which have just the right chemical reaction with the skin to keep it in a soft and pliable condition. When these fats are removed from the skin completely or in part through contact with industrial chemicals, undesirable chemical changes take place which not only bring about the destruction of the skin mechanically but opens the underlying cells to infection.

Types of Industrial Skin Hazards

"Dishpan hands," resulting from prolonged exposure of the skin to soap or alkaline solutions is not confined to the kitchen. Many industrial and trade processes subject the skin to rather strongly alkaline attack. The resulting roughening and the tendency to the formation of open fissures may bring about skin infections.

Allergies and the danger of malignant growths resulting from long exposure to industrial substances of relatively unknown potency are likely to become more common with the introduction into industrial use of many new industrial materials. It is only after such have been long in use that their dangerous character is identified.

Absorption of industrial poisons through the skin has long been recognized and safety measures have been standardized in most industries to meet this problem. Although the absorptive capacity of the skin is known to be low the danger of cumulative poisoning resulting in the gradual building up of dangerous concentrations in the body organs is ever present.

Burns from direct contact with hot objects are a well-recognized danger in some industries and much work has been done in providing for the safety of the worker by the use of asbestos gloves and clothing and through the use of mechanical safety devices. The dangers of *light* burns from such sources as the electric arc have not received as much attention from the worker as it should. In consequence severe *sunburns*, not only to the skin but the eyes as well have resulted too frequently in spite of provisions for clothing and goggle protection.

Protection of the Skin

Nature has provided the skin with remarkable protective powers. When the skin is subject to consistent mechanical abrasion the corneous outer layer thickens into callouses and corns. Exposed to strongly burning rays it tends to pigment or tan which protects it against further exposure.

The use of leather protective clothing has come down to modern times from prehistoric man. Many can remember the blacksmith of his childhood who used the leather apron to protect his body from forge sparks, hot iron, and the rough hoofs of the horses he was shoeing. Today it is the welder who finds it expedient to wear leather clothing. The use of leather gloves for protection of the hands from mechanical injury in the shop and on the job is, where the job demands it, the rule.

Industrial heat burns are most often avoided by use of protective devices like insulated working space, insulated handles, or by the use of asbestos gloves, masks, or clothing. Even slight burns constitute a considerable danger to the sufferer since they tend to become easily infected. The application of approved propriety drugs intended for use with burns and bandaging will usually enable the worker to return to his job. Moderate or severe burns need the attentions of a nurse or of a physician.

Burns resulting from exposure to light rays can be best avoided by the use of protective clothing. Leather is efficient not only because it is impervious to burning light rays but also because of its ability to protect the skin from contact with hot or molten metals. Tightly woven cotton, silk, rayon, or wool clothing is sufficient to prevent burning rays from reaching the skin. Where clothing proves impractical, protection may be secured by frequent and thick applications of fluorescent oils or by the use of a salicylate dissolved in a suitable mineral or vegetable oil. Such applications effectively screen out the burning rays while permitting the tanning rays to reach the skin. This causes pigmentation of the skin which acts as an effective preventative to subsequent burning from the dangerous rays. A number of cosmetic preparations intended for the prevention of sunburns are effective where industrial work subjects the skin to these injurious rays. Once incurred these burns may be treated like sunburns.

The alkalies, the sodas, potashes, and limes, are extensively used in many industries and their destructive effect on the skin is well known. Rubber or plastic gloves and clothing should be used whenever possible when these chemicals are handled. Leather, well oiled with a leather dressing, may be successfully substituted for rubber in rough work involving use of these alkalies. Routine washing with soap and water and the use of a good cosmetic or mechanic hand cream will do much to reduce the action of these chemicals on the skin. Where strong concentrations or prolonged contact are involved, immersion of or washing the hands in weak acid solutions such as boric acid, lemon juice, sour milk, or vinegar will stop the action of the alkali quickly, with little harm to the skin.

Subsequent use of some emollient cream or lotion or even kitchen fats will help to sooth the injured skin.

Strong mineral or organic acids are often very destructive to the skin. Of these sulphuric acid is one of the worst offenders since it is the most used of all industrial acids. When used in its more dilute concentrations as in storage batteries and in metal pickling baths it does not always at first make its presence felt. Its ability to concentrate by the evaporation of its diluting water enables it to act on the wetted skin powerfully. It dehydrates and destroys the skin which it touches frequently causing very serious consequences. Careful washing of the attacked skin with large amounts of water and the use of baking soda or dilute ammonia water will neutralize this acid.

In lieu of these, water and a detergent powder or soap may be applied to the affected part. Following the neutralizing treatment a thorough washing with soap and water, and the further application of a good cosmetic cream or lotion will help to allay any roughness or soreness resulting from the action of this acid.

Hydrochloric acid (muriatic acid) is frequently used in trade and industrial processes. Even in concentrated liquid form its contact with the skin, while irritating, is in no sense as harmful as is sulphuric acid. Its volatile nature causes it to evaporate completely from the skin in contrast to the behavior of sulphuric acid. Simple washing with water or the use of baking soda or soap will quickly neutralize this acid.

Nitric acid, which finds considerable use in industry, is a strong oxidizing agent which strongly attacks the skin forming a yellow compound. This later sloughs off on drying. In common with other acids nitric acid on the skin should be washed off or neutralized with soda or soap. Treatment of the injured skin with emollient creams or lotions will restore the natural softness of the epidermis.

Some of the concentrated organic acids like acetic or lactic can exercise a powerful chemical change on the skin. Injury to the skin from these acids may be treated exactly as those from the stronger mineral acids.

It is well known in the field of medicine that absorption of industrial poisons through the skin is slow but nevertheless a constant danger to the worker. Some poisons like lead are sometimes accumulated in some organ of the body over a period of time. Serious illness may result when their concentration has reached a stage when the normal functioning of the organ is interrupted. Lead in the form of tetraethyl lead used in gasoline can be absorbed through the skin. This product, along with others containing poisonous compounds, should be kept from the skin as much as possible to avoid their absorption. Many workers, ignorant of the nature of the materials they handle, may often experience illness of a baffling nature through skin absorption. Prevention is the only effective procedure when dealing with poisonous compounds.

Allergy to a great variety of substances is of more common occurrence among industrial workers than is generally known. Skin disturbances may arise from idiosyncrasies to even such substances as common water. Soap containing coconut oil causes skin rashes to a surprising number of people. Contact with dyestuffs and other coal-tar chemicals are poorly tolerated by many people. Those susceptible to such aggravating material are well advised to seek other employment or to protect themselves against contact by wearing rubber gloves or protective clothing. Sometimes skin creams containing an excess of stearic acid will act protectively after rubbing into the skin. Such protective creams are to be found in the market.

Solvents like gasoline, turpentine, paint, and lacquer thinners, alcohols, and the various ethers and ethers in common use are good fat solvents and readily dissolve and wash away the lubricating skin fats leaving the skin dry and irritated. Often these solvents, in addition to removing the natural skin fats are themselves quite irritating. Special hand stearic acid creams are obtainable in the market as skin protective applications. These are often quite efficient in protecting the skin from the consequences of defatting and irritation.

Cleanliness and Skin Infections

The healthy skin is quite resistant to penetration of germs to the lower tissue. When the skin retains its natural slightly acid reaction it is to some degree antiseptic. Modifications of the composition of the natural fats often resulting from imperfect health may cause the skin to lose some of its natural antiseptic reaction and bacteria may have an opportunity to secure a foothold in the sebaceous glands where they may multiply and start local or systemic infections. Under the same circumstances even small cuts or scratches may also become infected. Under these conditions and even when the skin is in fairly normal health the utmost cleanliness is necessary. The requisite cleanliness can best be achieved by the use of soap.

Soap

The cleansing action of soap is both mechanical and chemical. Well-made skin soap in contact with water forms, by hydrolysis, a very weak lye which acts on the skin fats as a solvent. This breakdown releases dust, germs, and skin debris held in the fat so that subsequent washing will quickly remove them from the skin. Soap also acts as an emulsifying and lathering agent. By forming a soapy film about the released particles of fat, germs, and dust, soap raises them from the surface of the skin, providing in this way an easy means of removal by means of washing. Rinsing with water washes the loosened and emulsified soil material from the skin.

Soap forms compounds with the skin surface which render it soft. Used in excess and over a protracted period they may defat the skin and cause it to become dry and rough. A great variety of soaps are made to supply all needs. Most of the standard brands of hand soap have been produced under careful chemical control and are quite free of the excessive alkali content which characterized the soaps of past generations. Some soaps, such as mechanics soaps, are sometimes rendered more effective in removing dirt and grease by the addition of alkalies and other detergents. Such soaps, while cleansing the skin rapidly, leave it strongly defatted and irritated. These soaps should be avoided.

Antiseptics and Germicides

Good industrial hygiene requires not only the cleanliness of the skin but attention to its injuries both large and small. Large injuries are invariably referred to the physician while the smaller ones are often neglected sometimes with serious consequences. Small cuts and abrasions of the skin often provide ready access to infective organisms to the lower more sensitive skin layers. Such organisms are found in great abundance in the shop and out on the job. The worker is often too busy or too intent on finishing some phase of his job to give the attention needed. An immediate application of some good germicide with applicators usually found attached to the stopper of the containing bottle will sometimes save much time and distress through the immediate stoppage of infection. Iodine and some of the mercurial germicides have been found to be most effective in preventing the infection of small cuts and abrasions of the skin. The addition of a bottle of a good standard germicide, recommended by physician or nurse, should be urged upon all workers and future workers in the interest of avoiding loss of time and incapacity due to infection.

Dangers of Improper Guidance in Vocational Education

*S. T. Hammond**

Education as a whole, in the past few decades, has undergone many major changes. Probably one of the greatest of these is that represented by the growth of the vocational curriculum in the secondary schools of the nation. From the small woodworking shop, previously known as the *manual training room*, this handwork process has blossomed into great school plants, incorporating machines of great complexity, and representing investments of many thousands of dollars.

What caused this miracle of change is now a matter of history. First the recognition by the educators of the need for visual

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material accomplishment on the part of the student. Then, the realization that all students are not cut from the same pattern; that some react more advantageously in dealing with concrete, rather than abstract, achievement. And finally, the belief that vocational education was necessary, due to a dire need for trained workers in propagating the war economy.

Each of these reasons may be held as sound. Few will oppose the general theory that training for jobs is good business — and good sense. Probably the best example of this premise is that provided in the training of workers for war plants, in which many crafts and trades were represented. The schools are to be commended for the parts they played in building the steam roller of industrial and vocational training which eventually crushed our enemies. No nation on earth has ever performed so great a job so swiftly and thoroughly. Hence, today, thanks to those political, industrial, and educational leaders who were, many years ago, farsighted enough to realize the values in our industrial and vocational training programs, industrial arts and vocational education is on more solid ground than ever before.

We are reaching a turning point, however. A point where certain symptoms of danger are beginning to make themselves evident. One of these dangers is the tendency among educators to lose perspective, with regard to the relative position or place of vocational education in the over-all plan of education in general. Instead of weighting the vocational curriculum with desirable and necessary values of academic and abstract learning, many of our present educational leaders believe that a certain portion (and that proportion is great) of our students are of such low intelligence, that they are either incapable of, or outright unfit for, academic learning. To one who watches over a small group of learners day by day, this attitude seems very marked, and very dangerous. More and more we realize that students are excused from basic and critical academic learning, on the flimsiest possible grounds. It has been found that, when certain students in the primary grades show tendencies of retarded understanding, they are almost immediately labeled as being of low intelligence quotient. And in spite of all that can be done to correct this fault in our guidance departments, that labeling sticks throughout the student's entire school life. It may be that, in the beginning, this type of student is only slow, not mentally or intellectually deficient.

In any case his labeling precludes him from the study of such worth-while subjects as mathematics, physics, and chemistry. And these subjects particularly are just exactly what this type of student *needs above all things else*. What a pity. When he enters the average vocational class, with such a handicap, he is unfit and unprepared to learn any but the simplest of industrial operations. It becomes necessary therefore, for the vocational instructor to spend many valuable hours in drilling on the fundamentals which should have been learned by rote in the lower primary grades.

It has now reached a point where student counselors, in their guidance programs, steer these students of *low mentality* almost exclusively into the trade-training or industrial-arts courses. The danger lies, therefore, in the degradation of the industrial-arts program to the level of *punishment courses*, or simply *corrals for the manipulative moron*, with whom no one seems to know just what to do. It would appear then, that if these programs are to be maintained on a level which may be even remotely considered as educational, another major change in educational standards is long past due.

It has been suggested, that if the student is to be given the foundation for his life's work in the secondary school and through vocational training, certain preparation for that training should begin in his tender primary years. This seems to be a good idea, as well as good sense. There can be no logical reason why the *drilling* of youngsters in the fundamentals of reading, writing, and arithmetic, should not be practiced in these lower grades, to provide them with mental working tools, no matter what their futures in the secondary schools may be. These learnings are vital in vocational and industrial work, as well as in secondary academic work.

The boy, or girl, who *cannot learn* in academic classes, has no place in the vocational field. The writer realizes that this statement is contrary to most present-day vocational ideology. In order to properly counsel and guide a student into a vocational or industrial course, certain standards of intelligence and capability should be rigidly maintained. There are several reasons for this, among which are:

1. No student who *cannot* grasp the subject of simple mathematics has any right to waste a vocational teacher's time, or the time of the rest of the class. That student cannot profit by the vocational course into which he finds himself improperly counseled.

2. No student of low intelligence quotient should be allowed to practice on expensive equipment, when a resulting error of judgment may cause the ruination of expensive parts or apparatus, or may cause or create a hazard or danger to himself or other members of the class. That student cannot possibly benefit from the training offered, and further, he is usurping the place of one who may benefit and profit.

3. Improper or unintelligent counseling of unfit students into vocational training programs will eventually so lower the content level of the course as to completely nullify the objectives and aims of the program.

We *must* bear in mind that these present attitudes are dangerous. We *must* see to it that higher standards of guidance and selection are established and maintained. We *must* see to it that administration greed, in securing federal funds for the establishment of so-called vocational training for returning war veterans, does not outweigh the true need for such classes, and result in the corruption and degradation of learning standards. We *must* establish better counseling practices, especially in the primary and lower secondary grades. We *must* see to it that our vocational students have a balanced curriculum, not all *shop*, not all *snap courses*, but abstract academic work as well to supplement the training for their future life's work.

We must accomplish all of these things, and more, if we are not to provoke an inevitable reaction against high costs of our work, and criticism against possible questionable pseudo training in the post-war era.

An Explanation of Offset Lithography

*Lieut. Comdr. R. Randolph Karch, U.S.N.R.**

A New Method Supplants an Old Method

At the turn of the century, lithography had a rebirth from the slow, flat-bed-press-and-stone method to the fast rotary-press-and-plate method. In the old method, an artist drew on lithographic stone. In the new method, photography places the image on a metal plate, which is wrapped about a cylinder. See Figure 1. A rubber blanket, not a stone, now places the ink on the paper. This makes it possible to print on almost any surface: rough paper, cardboard, metal, or cloth. Also, this fast-growing process is especially adapted to multicolor work.

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When Offset Lithography Is Used

In the three competitive *printing* processes: letterpress, offset lithography, and gravure, offset lithography is generally used:

1. When half tones are used on rough or uncoated paper stock.
2. On runs of over 20,000 impressions.
3. On large color spreads.

4. Where bleed-off cuts are used; that is, when the illustrations run off the margin of the page.

5. When the cost of letterpress half tones and line engravings are prohibitive.

Fig. 1. The old method of lithography is shown at the left; the new method, at the right

Step 1 — The Plate Is Grained

Offset-lithographic plates are made usually of cold rolled zinc or aluminum. Stainless steel and other alloys also may be used. Because these plates are smooth when new, they must be grained to give them a slightly roughened surface, which will hold water

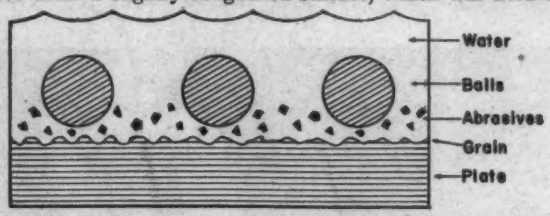

Fig. 2. An enlarged section of a lithographic plate, showing how the grain is put on the plate surface.

and ink. This is done in a grainer, which continually swings in an arc of about 2¾ in., at a rate of from 150 to 250 revolutions per minute. Steel, glass, wood, or porcelain marbles or balls press abrasives (aluminum oxide or carborundum) into the plate under water. See Figure 2.

Why Plates Are Grained

1. The grain provides an anchorage for the light-hardened colloid, or the image that is to be printed.

2. The grain provides a foundation for the attraction of ink from the inking rollers of the press.

3. The hills and valleys of the grain provide a support for the press rollers and the rubber blanket.

Fig. 3. The grained plate is carefully washed

4. The hills and valleys in a grained plate provide reservoirs for the moisture from the moistening rollers.

5. The images from old jobs are often removed by graining, because plates are used over and over again. Sometimes an old image is removed by rubbing the plate with kerosene and fine sand or pumice.

Step 2 — The Plate Is Counter-Etched

Counter-etching removes any foreign elements and oxidation from the plate. The plate is placed in a pan filled with a solution consisting of six ounces of acetic acid to one gallon of water. In about ten seconds the plate is removed from the pan, and washed in cold running water. See Figure 3.

Step 3 — The Plate Is Sensitized

The plate is prepared for the job of placing the image on the rubber blanket, which in turn will *offset* the ink to the paper. See Figure 4. There are many different formulas for sensitizers. One of them consists of the following ingredients:

2½ oz. of 2 egg albumin
1 oz. of ammonium bichromate
1½ oz. of 28 per cent solution of ammonium
23 oz. water

Fig. 4. The plate is sensitized on a whirler

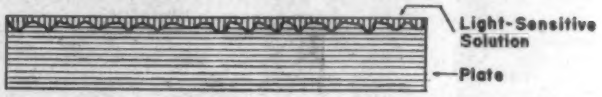

Fig. 5. The light-sensitive solution adheres to the grain of the lithographic plate

A whirler is used for coating the plate with the sensitizer. This device consists of a turntable within a circular pan. The plate is affixed to the turntable, grain up, and the solution for sensitizing is poured onto the middle of the plate while it spins. This insures an even coating by centrifugal force. See Figure 5.

Step 4 — A Negative Is Made

After the plate is prepared, a negative must be furnished of

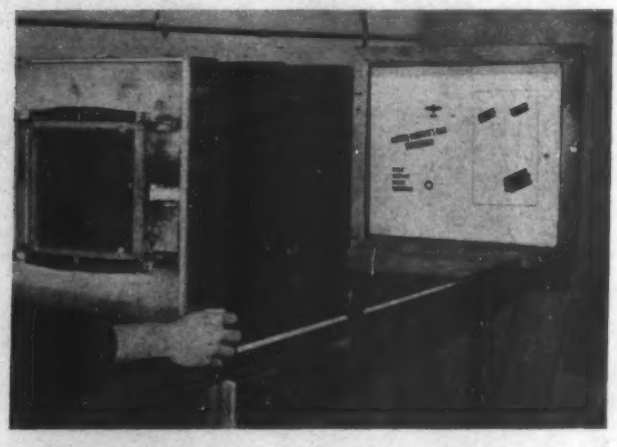

Fig. 6. A negative is made on a copying camera

the type or illustrations to be lithographed. This is done on a copying camera. See Figure 6.

Step 5 — The Plate Is Printed

The negative is locked against the prepared sensitized plate in a vacuum frame, and exposed to a strong light, usually

carbon arc. See Figure 7. An air pump sucks out air from a space between a sheet of heavy glass and a rubber mat, insuring a perfect and tight contact between the plate and the negative. In about six minutes the exposure is made, and the image from the negative has hardened certain portions of the plate. See Figure 8.

Deep-Etched Plates — The deep-etch process allows a slightly thicker film of ink to be laid on the paper, giving a greater richness in depth of color. When making a deep-etched plate, a *positive* (not a negative) is placed in contact with the plate, which makes a negative print. This makes the exposed parts of the plate insoluble in water, and forms an image substance for the negative print. Deep-etched plates are said to be slightly

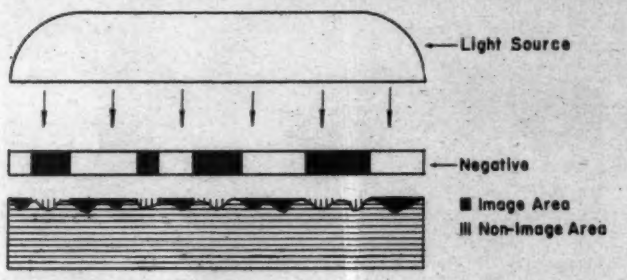

Fig. 7. Shows what happens in the vacuum frame. Light shines through the image area of the negative, hardening the light sensitive solution on the lithographic plate

Fig. 8. The negative is locked against the plate in a vacuum frame and exposed to a strong light

Fig. 9. The plate is developed with developing ink

Fig. 10. The plate is washed under running water to remove all developing ink except from the image areas

Fig. 11. The plate is placed on the plate cylinder of an offset press, and is ready to print the job

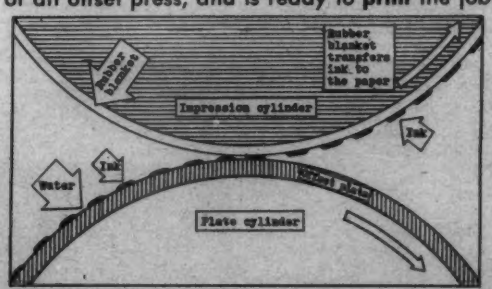

Fig. 12. The plate transfers the ink to the rubber blanket, and the rubber blanket then "offsets" it to the paper

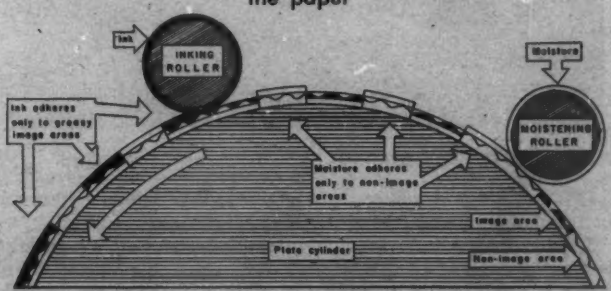

Fig. 13. The basic principle of lithography: "Grease and water do not mix." As the plate cylinder revolves to the left, moisture adheres only to the non-greasy, non-image areas. The greasy lithographic ink, on the other hand, adheres only to the greasy-image areas

intaglio; that is, the image is supposedly slightly below the surface of the plate, making deep-etched plates last longer than albumin plates.

The special developer, which is applied to the whole surface of the plate, dissolves the image or unexposed parts of the light-sensitive coating. The solution used in deep etching eats away parts of the grained surface, and forms slight recesses for the image areas. Developing ink is added to form a base for the image.

Step 6 — The Plate Is Developed

Developing ink is rubbed into the plate with a piece of cotton. See Figure 9. Then the plate is washed in a sink under running water, which removes the ink from the nonprinting areas. See Figure 10.

Step 7 — The Plate Is Gummed

Gum, consisting of gum arabic, phosphoric acid and water, is rubbed onto the plate. After gumming, the plate is ready for the offset press. See Figure 11.

How the Offset-Lithographic Press Operates

The principle of the operation of an offset-lithographic press is shown in Figures 12 and 13.

The Effect of Color on Working Efficiency

*Dr. Waldemar Schweisheimer**

Bright pigments are now taking the place of the drab hues of former days. Today, more than at any time, color is an important factor in buildings and factories, hospitals and sickrooms. The color of a wall, or of the upholstery on a piece of furniture, is usually chosen for its aesthetic effects, or for its ability to act as a reflector for the illumination. It has been found that the right colors and color combinations in our factories and houses, offices, shops, and travel accommodations are exceedingly important both for health and efficiency.

No More Gray Monotony

Past are the days when factory rooms, machine shops, stores, and workrooms were painted in gray, uniform monotony. Experts in color have found out that workers are in a better mood and consequently more efficient when they are working in gaily painted surroundings. This is especially true when work is done in artificial light. Only when walls and ceilings are painted the right colors, are the best possible light effects obtained. For machines heavy dark colors are less popular than a light to medium green or yellow-brown. These colors make the workshop lighter and more cheerful.

An American industrialist was invited to the newly built factory of his friend who was particularly interested in the tendencies of modern color selection and color effects. Somewhat amazed, he remarked, after the inspection: "Green machines, red table edges, blue waste buckets. Now all you need is violet clothing for the workers so they look like cardinals!" His friend with a chuckle said: "Look here!" and showed him the budget of his factory, including expenses for painting and modern equipment as well as the statistical figures of the increase in efficiency since the change to gay colors. These figures made the industrialist think twice, and after some days of reflection he sent his own color expert to his friend's factory in order to study the details for the changes he intended to make in his own plant.

Howard Ketcham, a color engineer who designs the interior decorations of planes for the Pan-American Airlines, has discovered that a green motif might be able to prevent air sickness, whereas brown and yellow colors probably induce it. He went so far as to advise the air lines to avoid serving coffee and mayonnaise because of their sickening color effects in the air. He suggested that in the new air liners even the sheets and blankets should be dominantly green.

Influence of Colors on People

Most young children prefer red. It is the favorite color of very young people. In later years, however, colors are preferred which have more of a soothing influence, such as blue and green. Blue color is known to usually have a good effect on working efficiency as well as on neurotic persons and neurasthenics. The office rooms of neurologists are sometimes painted or decorated in this particular color in order to produce a relaxing effect on the waiting patients.

The following effects of colors on human beings are considered average findings.

Red is a stimulating color which excites and increases the working power of the brain.

Yellow is a stimulating color which helps to energize the brain; in color therapy it aids in treating colds, paralysis, and chronic conditions.

Green, while not necessarily depressing, possesses cooling effects useful in the abatement of excitement. It counteracts brightness of sunlight.

Black is useful for toning strong colors. It is not actually depressing, but is best used in combinations.

White is cheery, and attracts sunlight. When used alone, it is cold. When used with red, yellow, or orange, it has a stimulating effect.

Brown is restful and warming, but it is depressing when used alone. Best effects are obtained when it is combined with orange, yellow, and gold.

Purple and mauve are sedative, soothing, and conducive to sleep. The latter opinion, however, is not unanimous. Dr. William S. Wadsworth of Philadelphia, a physician interested for many years in the study of color effects on human body and mind, points out that purple causes the greatest emotional upsets, though its effects will vary with the individual.

Black Machines on Black Backgrounds

Several years ago a shoe factory in Rockland, Mass., had continued complaints of eyestrain among workers. They complained about having headaches and blind spots. The workers were sewing black shoes with black thread on black machinery, and the line of demarcation was hard to see. The president of the company suggested painting the machines in lighter colors.

Other operators, according to Harland Manchester, asked permission to paint their machines, and before long the plant was a "rainbow run riot." Shoe machines bloomed in jade, rose, and orchid. With the new contrast between leather and cutting edges, there was less fatigue. The accident rate fell off nearly 70 per cent, and fewer damaged shoes were thrown into the "seconds" bin. Mr. Donovan, the president, called in a color expert and worked out a permanent scheme for his plant. Stationary parts of machines were painted buff, moving parts light green. There were no more complaints, and faster work, and fewer rejected shoes were the result. Many manufacturers have turned to colored machines and decorative schemes to fight eyestrain and fatigue.

In another case, according to Forbes, a radio tube manufacturer had stemming machines painted orange to make them stand out against the greens and blues of their gas flames and used pastel blue on the walls for cool color values, with a resulting 60 per cent reduction in rejections during the first week. Danger spots in machines are often marked a flaming red, and moving parts, handles, and shutoffs are

*New Rochelle, N. Y.

painted in contrasting colors to show up sharply against the background.

At an unusual dinner party given some time ago, Samuel G. Hibben, illumination engineer, tried the following experiment. After the guests had been seated at the banquet table loaded down with appetizing looking dishes, the lighting was switched, changing the color of all the food into disturbing hues. The steaks were a sickly gray, salads an ashen violet, fresh green peas looked like black caviar. Milk was blood red, eggs a distressing shade of blue, the coffee a sickly yellow. Most guests could not eat. Some who did became ill. The experiment, though not the dinner, was a complete success.

The psychological needs of the occupants of a room must be considered. Light colors have a stimulating and cheering influence on most people, producing very much the same effect as would friendly words of encouragement. Dark colors are not so stimulating. Few people are conscious of these psychological factors. All they know is that they feel attracted by one room in preference to another. The relation between the colors which surround us and the state of our physical and mental health, as well as working efficiency, has been only in part an object of scientific study. There is no doubt that the colors in workshops are of utmost influence on the mood of everyone who comes in touch with them. We may understand that lighting experts consider the use of color for "mood conditioning" the home, a supplement to air conditioning. As Mr. Hibben points out, lighting is entering a period of orchestration in which, like the instruments in an orchestra, all the new sources and colors will play parts.

Personality Training for Distributive Occupations

*Murray Banks**

It is generally agreed that no individual can succeed in any business position unless he has a fair degree of technical knowledge. On the other hand, no matter how much technical knowledge a man may have, he cannot hold his position if he possesses such destructive personality qualities as failure to co-operate, unreliability, carelessness, laziness, and dishonesty. It is also true that unless he knows how to analyze, compare, discriminate, think constructively, and use good judgment, he cannot advance very far.

Where theory and practice in training for business may be combined, real development and learning can be effected. To succeed in any position, particularly in those in the retail field, it is necessary for the student to acquire not only the technical skills and knowledges, but, in addition, the ability to solve satisfactorily the various human problems involving personalities which arise in daily business situations.

Personality — the Key to Advancement

Today, as always, a student can look forward to the years ahead, and to a large extent determine his future position by the amount of his business or vocational knowledge, and the development of his personality. The individual who acquires a knowledge of store management, salesmanship, and English without a further knowledge of human relations and personality training, cannot hope to advance beyond a certain limit of influence, position, and income.

Recently, a personnel director phoned the co-ordinator of a co-operative distributive education program, and said, "Send me a girl who has a superior personality. I am more interested in her ability to meet and get along with people than I am in her scholastic record."

I think it may be reasonably assumed that this attitude on the part of personnel directors and employers is fairly typical. We are living in a period in which the greatest importance is attached to those qualities and habits in an individual's make-up that are generally included in the term *personality*.

To succeed in the world of business, our students need more than just a knowledge of the job and the required technical skills. No matter how well the student has developed his vocational skills, he will neither be successful nor happy if he has not at the same time developed his personality to the degree that he is able to secure the respect and friendship of worth-while people, and enhance his chances for steady advancement in business, or industry.

When an employer evaluates an applicant, he wants to know something about the applicant's ability, knowledge, skill, and experience. In addition, the chief point he would like to know about the individual is covered by the everyday term *personality*. The commercial and social world is as never before personality conscious.

In speaking of a student's personality, we often say that Jim, for example, has a pleasing and forceful personality, that he is cheerful and even tempered, energetic, persistent and self-reliant. Many other adjectives could be mentioned that refer to an individual's personality; and certainly these qualities are of immense importance in work, in family life, and social life generally.

Persona, the Latin word from which *personality* comes, means *mask*. It is, then the *mask* one presents, the front one puts up; or to put it another way, personality may be thought of as the reaction or effect — positive or negative — that an individual elicits from people with whom he comes into contact.

No sound vocational training program, in the development of its curriculum, will fail to take into account that when all is said and done, more separations from employment can be attributed to personality defects than to any other single cause.

In the distributive education program in New Jersey, it is recognized that instruction in personality development is not some vague abstraction to be injected at some point in the program of training for business, or to be left until the concluding days of the training period when placement is imminent. It is something that is undertaken on a definitely organized basis on the first day of the training program, and continued throughout its entire length.

The primary objective of the training in personality development is the realization on the part of the student that only through abundant practice and consistently desirable behavior, can he develop an effective personality which will enable him, without conscious effort, to say the right thing or act in the right way at all times.

Students begin to understand that to win the prizes of successful living requires no rare, inborn qualities, no legacies of wealth and social position. The basic requirement is merely a resolute decision to use, to the full, all the potentialities of one's present self.

Most of the people we envy — the truly successful few — have merely learned how to tap their reservoirs of latent power. The rest of us — the mediocre many — live on an amazingly low plane of personal effectiveness.

"The fault . . . lies not in our stars, but in ourselves, that we are underlings," was Shakespeare's comment on such lack of self-mastery.

The student who studies the fundamentals of retailing, merchandise information, management, personality development, charm, good manners, and good grooming, opens up a whole new world of opportunity, influence, and increased income.

(Continued on page 18)

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Industrial Arts and Vocational Education

John J. Metz, Editor

ENCOURAGING THE BOY TO READ

You may know how to use your public library, but many of your students do not. As a matter of fact many adults are unaware of what the public library is offering to young and old alike, and many of them do not even know that they are paying taxes to support this institution.

The National Opinion Research Center, University of Denver, recently made a survey for the American Library Association which discloses the startling information that 45 per cent of those contacted did not know how their local public libraries got their money, 22 per cent of them were uncertain, and only 33 per cent knew where the money came from which supported the library. Of those who read, but who do not draw books from their library, 67 per cent confessed that they did not know, or at least were uncertain of the source of the money needed for the upkeep of the library.

The survey includes 2114 confidential interviews with persons distributed about equally between the following 17 cities: Atlanta, Baltimore, Buffalo, Chicago, Detroit, Hartford (Conn.), Houston, Kansas City (Mo.), Louisville (Ky.), Milwaukee, Newark, Philadelphia, Pittsburgh, Portland (Ore.), St. Louis, San Francisco, and Seattle.

With such a prevailing lack of knowledge about and understanding of our public libraries it would be well for our schools to acquaint all students with their local public library, its function and organization.

The shop with its reference books can help boys who do not possess any love for reading by giving them an impetus in acquiring the habit of referring to books for things they want to know. Then, when that habit has been established, they can be encouraged to read books on sports and adventure, and thus by easy stages be lead to acquire a taste for reading on a higher level.

Of course, reading is not one of the things that are stressed in the school shop, but the boy who makes things can be more easily introduced to the use of books. Why not capitalize on these by-products of shop instruction? Why not have a good set of reference books for the subject taught in the shop, and then have a few lists posted on the bulletin board, giving the titles of interesting novels, books of adventure, history, biography, and the like that can be drawn from the public library. Most of the libraries will be glad to prepare such lists, so that it will require little extra work for the shop teacher to give this service to his students.

DO'S FOR THE SHOP INSTRUCTOR

In a short article written for *The Texas Outlook,* Dorothy W. Baruch offered some important "do's" for teachers. The following "do's" for shop teachers are adapted from those that appeared in the *Outlook.*

1. Try to understand your students — they are young, they are inexperienced, they are beginners in the subject you are teaching. Try to sympathize with them. Remember how clumsy you were when you were at their stage of the educational process.

2. Let them explain what and how they want to do a job. If their method is not in conformity with good practice, explain calmly why your method is the right one to acquire and to follow.

3. Have a friendly shop atmosphere.

4. Cultivate the confidences of your students. Feel happy with them over their joys, and give them a sympathetic ear when they encounter woes.

5. Encourage parents to visit your shop.

6. Discuss with the parents what seems best for the welfare of their child.

7. Give the self-expressive urges of your students some encouragement.

8. Have them help you figure out solutions for some of the problems that arise in a shop class.

9. Let them get an insight into your own hobbies and introduce them to mediums other than those used in your own shop.

10. When a student becomes troublesome, try to get at the underlying cause. Let him see your intense personal interest in him.

TAKING CARE OF THE HANDICAPPED

The war has been instrumental in greatly increasing the number of handicapped people in our midst. Before these handicapped persons are returned to civil life, they are carefully informed of their rights and the opportunities that are open to them for education and training.

Not so fortunate are many of those who entered industry with the most meager training to help in increasing the output of our war-production plants in order that our fighting forces might be able to overcome the enemies to civilization.

What these workers who were injured in industry need is vocational rehabilitation. The splendid work done by our vocational rehabilitation classes deserves to be publicized more than it is.

Workers who have experienced the loss of limbs, or who have sight difficulties, heart trouble, and the like, need not lose hope because the vocational rehabilitation classes may be able to offer them courses which will prepare them to continue earning a livelihood and living a useful life.

Unfortunately, these sufferers do not know all that the state and federal government is offering to the handicapped. Those connected with the rehabilitation department, therefore, must make strenuous efforts to make known to the world just what they are offering and what they are accomplishing.

The handicapped must be informed that besides medical care, artificial appliances, and the like, excellent schooling opportunities are theirs for the asking. They must be made to understand that their lives henceforth can be as useful as they were before the handicap was encountered if they are willing to acquire the right attitude and put forth the effort required to train themselves for a new vocation.

SAFETY INSTRUCTION

Safety is a prime requisite in the school shop. Accidents don't take vacations; hence, our vigilance to keep accidents from happening to ourselves and our students must never relax.

Take for instance, the question of safe driving. Quite a number of our students drive automobiles.

With the increased travel brought about by the removal of gasoline rationing, and with the added hazards of winter driving, the subject of traffic safety may well be introduced into all school shops in order to reduce the frightful loss of human lives which, unfortunately, is on the increase because of man's carelessness and recklessness.

(Continued from page 16)

The development of poise, ability, and skill in dealing with a variety of people is an important objective of "co-op" training. Human relationships, and how to successfully get along with others, are the problems with which the "co-op" student concerns himself.

We, in vocational business education, speak often, and rather glibly of *personality development*. There seems to be a unanimity of opinion that more people are fired or resign from their positions because of personal difficulties than for any other reason. The challenge to education for economic living is painfully clear. No dispute can arise on the necessity and importance of guiding the student to effectively develop his personality.

When it comes to the question, however, of *how* to do it, the problem begins to assume rather large proportions, and many complexities are revealed. One thing, however, is certain; personality cannot be developed or altered to any extent by merely talking about it, or offering classroom lessons on "personality" topics.

To what extent can personality be developed by lecturing about it, chastising those who do not possess it, by harping on the need for it, or merely by setting a good example? It should be obvious that very little, if any, results can be achieved through the use of these academic methods.

Motivation

First, a student must be motivated, and he himself must earnestly desire to develop good personality traits. He must be impressed with the importance of personality in social and business life. Then, after the sincere co-operation of the student has been secured, both the teacher and the student must give constant attention to the matter.

Desirable progress in personal development and improvement is assured if the student is guided throughout the entire training program, not merely at rare intervals, to make the most of the chances that come his way from day to day for the development of right attitudes and pleasing conduct in the many relationships of the business and social environment in which he lives and works.

Personality — positive or negative — comes into play when one person comes into contact with another. It is developed by the student when he effectively makes the necessary adjustments to the varied situations which arise in his daily life. The implications for the teacher are clear. Situations must be provided where opportunities for expression and adjustment are present.

Real Life Situations

The co-operative program would appear to possess one of its greatest merits then, in the fact that it provides an abundance of real life situations for the student, while he is still in school to receive the careful and sympathetic guidance of the teacher-co-ordinator.

Where else but on a real job does there exist so strong a requirement for getting along with others? The ability to co-operate with one's fellow workers needs development and emphasis.

The co-operative program provides the student with an opportunity to participate in the social relationships in which he needs to develop greater ability. Work experiences supply a number of social contacts. This is particularly true in retailing. With these contacts comes the stimulus to improve one's social abilities.

By careful and systematic follow-up and co-ordination, it is possible to note the progress a student is making. When the pupil has an opportunity for genuine work experience at a real wage, he is brought face to face with actual business situations. It is possible for us, in offering the related instruction to give the student the tools with which to cope in these situations. The teacher-co-ordinator is in a key position to do something really tangible and measurable in personality development.

In distributive occupations, personality is one of the essential ingredients. To the customer in even the largest store, the salesperson *IS* the store. The merchant, naturally, wants his employee to represent the store adequately in meeting and serving a trade which has been carefully established. He expects qualities of courtesy and consideration developed to a high degree. He expects a well-groomed businesslike appearance, accuracy, honesty, and a knowledge of, and ability to use desirable English. He wants an employee who performs his duties efficiently and cheerfully. He puts a premium on those who are willing to accept responsibility, and who are reliable.

One of the things a businessman likes about an adding machine is its reliability. Its accuracy can always be depended upon. An employee who can always be depended upon to carry out definite instructions is almost invaluable.

The consumer expects to meet an intelligent, well-informed and helpful salesperson, who is eager to serve, and capable to advise. She appreciates the courteous service which a salesperson, who is capable of analyzing her needs quickly, and meeting them accurately, renders. *That* is the store to which she will return, and *that* is the salesperson whom she will seek out.

Opportunities to meet and to deal with people on a real job under actual business situations cannot be effectively or realistically simulated. Only by placing the student in a position where the social qualities are brought into play, can these objectives be achieved.

Kenneth Lawyer makes the following succinct statement:[1]

"Daily co-ordination, one of the key features of distributive education's unique combination, is the means whereby the teacher keeps aware of change, and keeps subject matter alive daily as it serves training objectives. Generally speaking, it is an innovation. Briefly, it is a means whereby today's classroom work is interpreted and presented in terms of needs recognized on a visit to the worker on his job perhaps less than twenty-four hours before. It is a daily check on, and adjustment of, both the general and specific aspects of the job analysis. That is, it takes into account the changes in all jobs of all trainees in the occupational group as it studies and seeks to meet individual trainee's course needs."

Individualizing the Training

Individual conferences — a discussion of personal and job problems — is an integral part of co-operative distributive education. Personal teaching in this program, is an essential phase of the co-ordinated plan of instruction, for the valuable information received in co-ordination is often personal, and therefore, can best be taught individually.

The outline which follows will give some conception of the lesson units in an organized program of instruction for personality development. It should be remembered that regularly scheduled conferences, both individual and group, are a part of the teaching plan.

I. *What Personality is and its Importance*

Definitions of personality. An analysis of personality factors. Personality — hereditary, or acquired? Personality and pay checks. Why people lose their jobs. Personality and success in business.

II. *The Kind of Personality People Admire*

What personality traits are most admired in men and women? What personality traits are most disliked? Habits that handicap and attitudes that antagonize. Physical characteristics that hurt your personality. Making an inventory of your personality traits to note strong points and weak points.

III. *Physical and Mental Health*

Posture. The importance of posture in making a good impression. The effect of posture on your health and mental attitude. How to stand, sit, walk, stoop, and rise gracefully. Posture analysis; posture corrections. How to eliminate annoying mannerisms. *Health and Vitality.* The effect of health on personality. Physical vigor and age. A program for health. Exercises for keeping fit. Diet and health. Regulating your weight. Sleep and recreation. Care of the body. Care of the face, hands, hair, eyes, teeth, and feet. Establishing good health habits. *Mental Health.* How to control your health and emotions through positive thinking. The effects of hatred, love, and self-centeredness on your health and personality. The influence of your personality on your classmates and co-workers. How to overcome fear. How to become emotionally mature. The charm of a well-balanced sense of humor. How to acquire self-confidence and poise. How to become attractive and happy.

IV. *Dress and Grooming*

Making your Clothes enhance your Personality. Fundamental principles of dress.

[1]Lawyer, Kenneth, "Distributive Education in the High School — Vocational Education at Its Best," *Distributive Education Review*, Massachusetts State Department of Education, Boston, Mass. December 1941, p. 93.

The Well-Dressed Woman. How to select clothes to make yourself appear taller or shorter, plumper or thinner. Making colors work for you. The principles of color. A practical color chart. How to combine colors. Fabrics to fit the occasion and flatter you. Choosing your accessories. How to choose your hat, shoes, hose, and gloves. What the business woman should wear. Evening clothes. Planning your wardrobe. Care of your clothing. *Good Grooming.* Personal cleanliness and daintiness. How and when to use perfume. Coiffures that flatter. The right make-up for you. Making the most of your eyes. Beauty hints from Hollywood. *The Well-Dressed Man.* The importance of being well dressed. How to select a suit that will hide your defects and bring out your good points. Overcoats. How to select the most becoming hat. Good taste in shirts, collars, and neckties. Selecting shoes, hose, gloves, jewelry, mufflers. What clothes the well-dressed man should own. What to wear and when to wear it. A guide for formal dress. Pointers on grooming. The hair and its care.

V. *Voice and Expression*

Voice Improvement. How to lay the foundation for a pleasing voice. How to improve the tone of your voice. Keeping your voice young. What your voice reveals. Exercises for improving strength, quality, tone, and resonance. *Personality and Speech.* The effect of your command of words on your personality. Expressive words. Undesirable words and expressions. Special points on correcting common speech faults. How to improve your enunciation and pronunciation. Words often mispronounced. *Social Conversation.* What to avoid in conversation. Religion. Politics. Meaningless gestures. Constructive listening. What makes good conversation. When and how to tell jokes. The fine art of repartee. Telephone conversation. *Good English in Business.* Business conversation. How to apply for a position. Making the sales talk. How to paint word pictures. Business letters. Planning your letters. Giving your letters personality. Making your letters easy to read.

VI. *Mind and Background*

Keeping Up with the World of Knowledge. A background of general knowledge. Reading for background. Ways to build background. *Know your Work.* How to analyze your work. How to meet competition. How to make a position a stepping stone to the position higher up. *Increasing Mental Efficiency.* How to read constructively. How to read rapidly and retain what you read. How to concentrate. How to improve your memory. How to think.

VII. *Character and the Basic Laws of Success*

Living and Working with Others. Character. The keystone of personality. Character traits. Morality. Building good character habits. How to break bad habits. Character and facial expressions. *Etiquette in Business.* General principles. The difference between social and business etiquette. Emotions and business. How to make office introductions. *The Principles You Live By.* The need for a guide to successful living. Selecting your goals. Achieving your goals. The way to success and happiness.

In addition reports from employers are discussed individually with each student, and means for improvement and further development are suggested.

Thus it is possible to equip students with the tools which they require to meet the various social situations arising in business. Best of all, it is possible to note deficiencies more carefully, suggest improvement, and at frequent intervals to ascertain from reliable sources the progress made. Maladjustments and personal difficulties which graduates are ordinarily left to grapple with themselves, are detected and treated while the trainee is still in school and has the advantage of *talking it over* with the co-ordinator, and is guided to make the necessary adjustments. The co-operative student has the distinct advantage of a variety of job experiences and learns by actual work experience to adjust himself to a real job.

Personality development, a subject, which at first thought, might be considered a superficial matter, upon examination proves to be no such thing. It has a definite place in the training of people who work for a living. Educationally, it is a big problem, for instruction must be personalized to an even larger extent than it is at present.

The situation which faces us is very like the one in which a curious young man, observing a woman pushing her way into a subway train, followed by about a dozen children, asked, "Madam, are these children all yours, or is this a picnic?" The woman glared, and tersely replied,

"Young man, these are all mine, and it ain't no picnic!"

So it is with us; our personality traits are all ours, and the attendant problems cannot by any stretch of the imagination be construed as a picnic.

Education and vocational preparation are basic. They are the fundamentals without which an applicant for a position is not even considered. However, they are not what decides who gets the job. We must admit that without personality, nobody gets on anywhere, no matter what else he may have; and that with it, everybody will get on everywhere, no matter what else he may lack!

Testing and Tests

ELEMENTARY TEST ON IMPOSITION AND LOCKUP FOR THE PLATEN PRESS

ISRAEL BENSMAN

Central High School
Sheboygan, Wis.

True-False Items

.... 1. Imposing stones are so called because they are made of stone.

.... 2. When neither dimension of a form agrees with a standard length of furniture, the *chaser* method of lockup is used.

.... 3. In lockup, each quoin should be completely tightened before proceeding to tighten the next quoin.

.... 4. There is *no* difference between "stone lay" and "sheet lay."

.... 5. The quoins should be pressed together (or tightened) only slightly before the type is planed.

.... 6. Lockups that expose the rollers of the press to the sharp corners of rule should be avoided.

.... 7. A form that has been locked so tight that it raises the chase from the stone causing it to wobble is said to be "sprung."

.... 8. A type planer does not differ in construction from that of a proof planer.

.... 9. Wood furniture used in lockup is satisfactory for close-register work.

....10. In tying up forms before placing them on the stone, one should make a hard knot at the last corner so that the cord will not untie.

....11. A sheet used to check color on a job is called a "position sheet."

....12. When parts of a form fail to lift, one should wedge the type together forcibly.

....13. Pieces of reglet should always be placed on both sides of the quoins to protect the furniture.

....14. Quoins may be tightened without restraint as the metal chases cannot possibly crack.

....15. Quoins are generally placed in the chase so that they are on the top and right of the form.

Completion Items

Reglets are available in two widths and are known as

16. ..... reglets, and
17. ..... reglets.

A metal device which fits into and turns quoins for locking and unlocking type forms in a chase, is the quoin

18. .....

Pieces of rectangular wood and metal used in blocking out type forms in a chase are known as

19. .....

Two ordinary methods of correct platen-press

lockup, each requiring a different arrangement of furniture are the

20. ..... method, and the
21. ..... method.

The two popular styles of quoins used to lockup type forms in a chase are

22. ..... quoin, and the
23. ..... quoin.

The amount of pressure applied in a lock up is referred to as

24. .....

Type which fails to stand squarely on its feet in lockup is said to be

25. .....

KEY

1. False	4. False	7. True	10. False	13. True
2. True	5. True	8. False	11. False	14. False
3. False	6. True	9. False	12. False	15. True

16. nonpareil	20. chaser	22. Wickersham
17. pica	21. furniture-within-furniture	23. Hemple
18. key		24. squeeze
19. furniture		25. off its feet

TEST ON THE ELEMENTARY PRINCIPLES OF THE ATOMIC BOMB AND THE SPLITTING OF THE ATOM

WALTER G. HJERTSTEDT

Lane Technical School
Chicago, Ill.

"America has a great reservoir of scientific talent — therein lies one of the greatest hopes for the future of this country. For America to abandon military research and engineering development would be tantamount to national suicide. In peacetime as well as in war, research must be maintained on a wide basis in order to seek solutions of scientific problems from as many angles as possible. There cannot be too many laboratories; each presents opportunities for scientists to test and to develop new ideas. Competition among them is the spice of invention." — *Brigadier General David Sarnoff.*

Objectives

1. To test the pupil's knowledge of the fundamental and elementary principles of the atomic bomb and the splitting of the atom.
2. To test the pupil's vocabularly and knowledge of the terms as applied to the atomic theory.
3. To discover the correlation existing between industrial arts and the study of the atomic theory.
4. To find out how to adjust the content of the industrial-arts program to the atomic age.
5. To find out how to enrich and vitalize the industrial-arts program by introducing selected material from physics and chemistry as applied to the atomic theory.
6. To capitalize upon the natural interests of the child and to encourage him to become more conscious of the underlying principles of the atomic theory.
7. To discover in the child, endowments which might well be capitalized, and abilities which should be recognized and cultivated.
8. To compare attainment with ability and capacity to attain so as to guide learning into channels best suited for each individual pupil.
9. To be able to provide better educational and vocational guidance and to intelligently plan suitable training.
10. To understand and guide the child better from the atomic age standpoint and to test his abilities and interests.

Scoring the Test: To get the total raw score for the complete test add the individual raw scores found at the end of Parts I, II, III, IV, V, VI, VII, and VIII respectively.

Raw score for Part I .....
Part II .....
Part III .....
Part IV .....
Part V .....
Part VI .....
Part VII .....
Part VIII .....

Total raw score or total number of questions answered correctly for complete test .....

General Directions: The aim of this test is to give you an opportunity to show what you have learned from your study of the atomic bomb and the splitting of the atom. It is not expected that you will be able to answer every question. Read the directions and every statement carefully and be sure you understand what you are to do before you begin.

Part I

Specific Directions to the Student: Some of the following statements are true and some are false. Read each statement carefully. If the statement is true, place a *T* in the parenthesis before the statement, as in item 1. If the statement is false, place an *F* in the parenthesis, as in items 2, 3, 4, and 5. You will not be penalized for statements incorrectly marked.

Example:

(T) 1. Uranium is the heaviest known chemical element found in the natural state.
(F) 2. Helium is an inflammable gas.
(F) 3. Natural radioactivity is the key mechanism of the atomic bomb.
(F) 4. Sir Ernest Rutherford has made notable contributions to the problems of the structure of the atom and the electrical nature of matter.
(F) 5. The discovery of plutonium was of little importance in the manufacture of the atomic bomb.

( ) 1. Plutonium is an isotope of uranium.
( ) 2. Radium mixed with thorium is a common source of neutrons.
( ) 3. All atoms of the same element are alike in their properties.
( ) 4. In the eighteenth century great advances were made in the science of electricity.
( ) 5. Alchemists dreamed of making gold by breaking up and combining common materials.
( ) 6. A neutron is a particle which has an electric charge.
( ) 7. Pierre Curie and his wife were successful in isolating radioactive polonium.
( ) 8. Before the war it was discovered that slow moving neutrons could split the atoms of the uranium isotope U-235.
( ) 9. Beta rays are more easily absorbed than alpha rays.
( ) 10. The chief radioactive mineral is quartz which is an ore containing uranium.
( ) 11. X-rays discovered fifty years ago by Wilhelm Konrad Roentgen started a spectacular trail of research that produced the atomic bomb.
( ) 12. In 1896 Henri Becquerel discovered radioactivity which is the spontaneous release of atomic energy by certain heavy gases.
( ) 13. In most cases those radioactive substances which emit beta rays also send out gamma rays at the same time.
( ) 14. The vast power of the atom was demonstrated on August 4, 1945.
( ) 15. Only one part in 160 of ordinary uranium is U-235.
( ) 16. The atomic weight of oxygen is 16.
( ) 17. Chemistry made very rapid progress from the end of the seventeenth century.
( ) 18. Beta rays are streams of high-speed electrons which are called beta particles.
( ) 19. Dr. Meitner published the first notes on uranium splitting.
( ) 20. Radium is a constant source of heat which seems to diminish as time goes on.
( ) 21. The mixture of U-235 and U-238 is extremely difficult to separate.
( ) 22. It takes 1850 protons to weigh as much as one electron.
( ) 23. X-rays helped Antoine Henri Becquerel at Paris to discover radioactivity in 1896.
( ) 24. Eventually radium turns to lead.
( ) 25. While searching for the source of radioactivity in minerals, Pierre Curie and his wife, Marie Sklodowska Curie of Paris, isolated a small fraction of a gram of radium salt from tons of uranium.
( ) 26. The atoms of different elements are alike.
( ) 27. The study of protons and electrons and the structure of the atom is a field covered jointly by physics and chemistry.
( ) 28. U-235 can be separated from uranium comparatively easy by chemical means.
( ) 29. The atomic bomb is more than 12,000 times as strong as the best improvement on TNT.
( ) 30. The average life of actinium is 30 years.

Scoring Part I: Raw score or total number of questions answered correctly .....

Part II

Specific Directions to the Student: Some of the statements which follow are true and some are false. Read each statement carefully. The false statements have been falsified by the insertion of an incorrect word instead of a correct word. Underline the word in each false statement which makes the statement incorrect. Letter neatly the correct word in the blank space immediately following the statement.

Example:

1. Henri Becquerel's research work led to the discovery of plutonium by Pierre and Marie Curie. 1. radium
2. The speed of X-rays is 186,000 miles per second. 2. .....
3. In December, 1942, the United States government started the erection of two atomic bomb plants. 3. .....
4. As ionizers beta rays are roughly 100 times as effective as alpha rays. 4. gamma
5. Dr. Alfred O. Nier at the University of Minnesota is credited with isolating the first tangible quantity of U-238. 5. U-235

1. The cost of the atomic bomb to the United States is to be spread over five years. 1. .....
2. The studies at Columbia revealed that when a uranium atom split in two, the amounts of energy suggested by Dr. Meitner actually were released. 2. .....
3. The highest known valence is eight. 3. .....
4. In March, 1943, a large plant to design, assemble, and test the atomic bomb was

constructed at Hanford, N. Mex. 4. .....

5. Professor Enrico Fermi, a Nobel prize winner, left Fascist Italy to work at Columbia University. 5. .....

6. The smallest unit of work is the dyne centimeter, which is called the joule. 6. .....

7. The world's first chain reaction pile—a uranium lattice and a graphite moderator took form on a squash court under the stands of the University of Chicago's football field. 7. .....

8. The neutron was discovered in England by Dalton. 8. .....

9. The heaviest and most complex of all atoms found in nature is the atom of uranium. 9. .....

10. A large plant to manufacture plutonium was constructed on the desert near Yakima, Wash., at Oak Ridge. 10. .....

11. The most important element in the bomb that struck Hiroshima is reported to have been U-235, and the one that hit Nagasaki is said to have been U-238. 11. .....

12. When natural uranium is bombarded with slow neutrons more happens than the cracking of the U-235 particles. 12. .....

13. Andre Debierne of France prepared a pure compound of radioactive plutonium. 13. .....

14. When the internal structure of a molecule is disturbed heat and light are radiated. 14. .....

15. Radium loses one fourth of its energy in 1700 years. 15. .....

Scoring Part II: Raw score or total number of questions answered correctly. .....

Part III

Specific Directions to the Student: Answer each of the following questions with a single word or formula. Letter neatly the answer in the blank space to the right of the question.

Example:

1. What is the part of the atom called which holds a positive charge of electricity? 1. proton

1. What did it cost the United States to develop the atomic bomb? 1. .....

2. What is that part of physical science called which is concerned with quantitative relations? 2. .....

3. How many parts does an atom break into when a uranium atom is hit by a neutron? 3. .....

4. What is the last name of the man who in 1905 conceived the idea that mass and energy are the same thing although in different states? 4. .....

5. What is the collective term which indicates the massing together of atoms, molecules, or combination of molecules into a gaseous, liquid, or solid state? 5. .....

6. What is the new element called which is produced by the bombardment of U-238? 6. .....

7. What is Einstein's formula for the conversion of mass into energy? 7. .....

8. What are substances called which have the same chemical and physical properties but differ slightly in atomic weight? 8. .....

9. Give the last name of the man who appointed an Advisory Committee on Uranium. 9. .....

10. What is the last name of the man in England who discovered the neutron in 1932? 10. .....

11. What is the name of the element which was first known to be radioactive? 11. .....

12. When uranium is bombarded by slow neutrons and the U-235 particles are cracked, what is the name of the unstable element which soon turns to plutonium when the neutrons produced by fission are absorbed by the U-238? 12. .....

13. Who first isolated the element thallium? 13. .....

14. What is the concentrated bit of matter at the center of the atom called, which measures not more than a few million-millionths of a centimeter in diameter? 14. .....

15. What is the term used to express the changing of atoms of nitrogen into atoms of oxygen? 15. .....

Scoring Part III: Raw score or total number of questions answered correctly. .....

Part IV

Specific Directions to the Student: Each of the following sentences, defines one of the words shown at the end of Part IV of this test. Make the proper connections by lettering neatly the number preceding the sentence in front of the word at the end of this test with which it should be associated.

Example:

1. One of the only two known elements that can be successfully used at present as an explosive for the atomic bomb.
2. A neutral particle without electric charge. A part of the nucleus of an atom.
3. The process of removing or of adding electrons to neutral atoms or molecules.
4. A mixture of U-234, U-235, and U-238.
5. The Greek name for amber.

.... disintegration .... aggregate
5 electron .... actinium
4 uranium 1 plutonium
.... radiate .... proton
2 neutron 3 ionization

1. An elementary particle of matter comprising a cluster of atoms.
2. Also called a spark glass and invented by Sir William Crooke, famous English physicist.
3. An elementary negative particle of electricity and a part of the atom.
4. An instrument which measures the rate and intensity of gamma ray emanations.
5. A unit particle of radiant energy such as heat, light, or X-rays.
6. A form of uranium which can blow itself up and is one of the rarest substances known. It was the most important element in the manufacture of the atomic bomb.
7. The heaviest known chemical element which in the pure state may be obtained as a black powder readily oxidizing in air.
8. High speed electrons of negative electricity.
9. A very small unit of work.
10. A familiar word in biology but a new term in physics. It was first used by Dr. Meitner.
11. The science which treats of the composition of matter, and the changes which occur in the composition of a substance.
12. The principal tenet of the alchemist's faith.
13. Uranium's most important mineral source.
14. According to physics, whatever possesses inertia.
15. A concentrated bit of matter at the center of the atom which measures not more than a few million-millionths of a centimeter in diameter.

.... nucleus .... erg .... uranium
.... quartz .... proton .... constant
.... electron .... fission .... molecule
.... U-235 .... joule .... photon
.... matter .... physics .... diffusion
.... U-234 .... U-238 .... graphite
.... beryllium .... pitchblende
.... detonator .... alpha particles
.... chemistry .... spinthariscope
.... transmutation .... beta particles
.... Geiger counter

Scoring Part IV: Raw score or total number of questions answered correctly. .....

Part V

Specific Directions to the Student: The following questions can be answered by a single word. Complete each statement by lettering neatly the missing word in each blank space. Your score for this part will be based on the number of blank spaces correctly filled. No penalty will be exacted for blank spaces incorrectly filled.

Example:

1. Plutonium derived its name from Pluto, the God of Hades .....
2. By bombardment with radioactive particles Sir Ernest Rutherford succeeded in changing a few nitrogen atoms into oxygen .....

1. The submicroscopic particles of water consist of one oxygen and two hydrogen atoms bound together to form a water .....
2. The first chain reaction experiment at the University of Chicago marked the beginning of the ..... age.
3. Subatomic particles without electric charge are called .....
4. Cathode rays are emitted at the ..... electrode.
5. Many consider the Italian born scientist, Dr. Enrico Fermi, the world's foremost ..... physicist.
6. Sir Ernest Rutherford made the first picture of the .....
7. Like the rare U-235, plutonium is fissionable and can be made to explode in a violent .....
8. To give the plane a chance to travel a safe distance, the bomb that dropped on Hiroshima was attached to a .....
9. In 1861 Sir William Crooke isolated the metal .....
10. When X-rays, gamma rays, ultra-violet rays, alpha particles, or rays pass through a gas, its molecules are .....
11. The fact that slow neutrons are more effective in splitting atoms than fast ones was discovered at Columbia by .....
12. The neutron weighs almost exactly the same as the .....
13. Bohr followed out the theory that an atom consists of a small positively charged nucleus surrounded by negative .....
14. There are many possible ways of separating U-235 from natural .....
15. An atomic bomb was dropped on Hiroshima and on the naval base at .....

Scoring Part V: Raw score or total number of blank spaces correctly filled. .....

Part VI

Specific Directions to the Student: The following questions can be answered by a single word. Complete each statement by lettering neatly the missing word in each blank space. The missing words may be found in the list of words at the end of Part VI of this test. Do not use the same word more than once. Your score for this part will be based on the number of blank spaces correctly filled. No penalty will be exacted for blank spaces incorrectly filled.

Example:

1. Becquerel observed that photographic plates turned black if they were placed in the same dark drawer with a few atoms of uranium .....
2. Only one part in 140 of ordinary uranium is U-235 while most of the rest is U-238 another isotope .....

3. Like U-235, plutonium can be made to explode by atomic ..... fission.

fission	isotope	uranium
quartz	proton	ionization

1. The United States entered the atom race in the fall of 1939 when President Roosevelt appointed an informal advisory committee on .....
2. The simplest atom is that of ..... gas.
3. At present three series of radioactive substances are recognized: the uranium—radium, the thorium, and the ..... series.
4. Late in 1938 Otto Hahn, a German chemist, was bombarding uranium with slow low-energy neutrons and as one of the end products he identified .....
5. The heart of helium consists of two protons and two .....
6. The first indications of the existence of radioactivity were obtained in 1896 by .....
7. Radioactive elements as they give off their radiations change to other elements, the metal uranium changing to radium and finally to .....
8. A molecule is an elementary particle of matter comprising a cluster of .....
9. A great deal of credit for the development of the atomic theory is given to a student of Sir Ernest Rutherford, namely: .....
10. U-235 is one of the heaviest metals known with an atomic weight of 235, which means it is approximately 235 times heavier than .....
11. The story of the experiments leading up to the atomic bomb is told in a report issued by the war department and is known as "The ..... Report."
12. The idea of a proton had its origin in the Quantum Theory devised in 1910 by .....
13. While the German scientists may have tried to use heavy water to slow the speed of the neutrons, the Manhattan District men use .....
14. To produce heavy water for the production of the atomic bomb the Nazis used a huge nitrate plant at ....., Norway.
15. Beryllium is a metallic chemical element belonging to the same group as .....

actinium	Narvik	pitchblende	photons
350	Bohr	Dalton	200
barium	Hoskins	300	Rjukan
electrons	250	Oslo	oxygen
Becquerel	protons	nitrogen	neutrons
lead	magnesium	iron	
graphite	hydrogen	uranium	
atoms	Smyth	Planck	

Scoring Part VI: Raw score or total number of blank spaces correctly filled. .....

Part VII

Specific Directions to the Student: Each of the following statements can be correctly completed by the use of one of the words contained within the parentheses. Underline the correct word in each sentence.

Example:

In the decade following Sir Ernest Rutherford's work, one series of experiments led to the discovery of the (proton, electron, photon, neutron).

1. U-235 was discovered by Arthur J. Dempster at the University of Chicago by means of Dempster's atomic microscope or mass (electrometer, moderator, stoichiometer, spectrograph).
2. When the standard volume is taken as that volume in which there is contained one molecular weight of a substance, the resulting constant is called (Bohr's, Avogadro's, Planck's, Chadwick's) constant.
3. The experiment of the original uranium pile at the University of Chicago had been dangerous but the giant piles were studies in unexplored dangers at (Manhattan, Los Alomos, Hanford, Grand Coulee).
4. The first cyclotron was built by Ernest O. Lawrence in 1929 at the University of (Chicago, California, New York, Pittsburgh).
5. The Quantum Theory, in which energy may be said to be considered as of atomic structure, having an individual unit less than which is nothing, was advanced by (Planck, Mendeleyoff, Avogadro, Bohr).
6. At the City of Pluto where a part of the atomic bomb was manufactured, the radioactive dust in the air was measured by a device called (Crooke's Tube, Moderator, Phosphoroscope, Sneezy).
7. Neutrons in the upper air have greater energy than those studied in atom-smasher (cyclotrons, electrometers, phosphoroscopes, spectrographs).
8. The credit for establishing the periodic law in its most definite form is generally given to (Mendeleyeff, Planck, Avogadro, Bohr).
9. Under the cover name of "The Metallurgical Laboratory" some of the most important atom splitting discoveries were made at the University of Chicago under the direction of (Lawrence, Hahn, Compton, Meitner).
10. The lightest of the known chemical elements is (oxygen, hydrogen, helium, nitrogen).
11. The atomic reaction which took place in the manufacture of the atomic bomb does not take place in nature as a (chain, spark, cosmic, dialectric) reaction.
12. Atom fission can be accomplished by mixing a tiny amount of radium with powdered (graphite, magnesium, beryllium).
13. In the uranium atom (U-238) there are (126, 136, 146, 156) neutrons.
14. A joule is (10, 100, 1000, 10,000) ergs of work.
15. The United States government has appointed a special committee of scientists to investigate the peacetime possibilities of atomic power, and the first report is that the atomic power for special purposes can be developed in (10, 20, 30, 40) years.

Scoring Part VII: Raw score or total number of words or numbers correctly underlined. .....

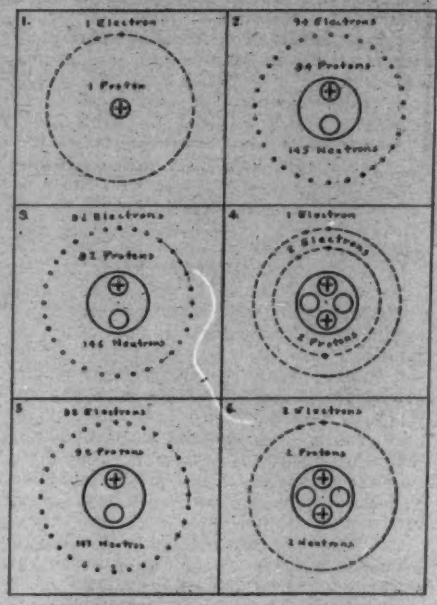
Part VIII

Specific Directions to the Student: In the diagrams which follow, you will find graphic representations of six elements. Each graphic representation numbered from 1 to 6 represents a different element. In the list are given the names of these elements. Make the proper connections by lettering neatly in the blank spaces the number which corresponds to the element listed. You are not expected to fill in all the blank spaces as there are more blank spaces than elements in the diagram.

Example:

•= Electron ⊕= Proton ○= Neutron

..... aluminum; ..2.. carbon; ..1..neon.



..... helium	..... nitrogen
..... sodium	..... uranium 238
..... lithium	..... aluminum
..... oxygen	..... plutonium
..... hydrogen	..... neptunium

Scoring Part VIII: Raw score or total number of spaces properly filled in. .....

KEY — PART I

1. F	7. T	13. T	19. T	25. F
2. F	8. T	14. T	20. F	26. F
3. T	9. F	15. F	21. T	27. T
4. F	10. F	16. T	22. F	28. F
5. T	11. T	17. F	23. T	29. T
6. F	12. F	18. T	24. T	30. F

KEY — PART II

1. (five) should be (three)
2. T
3. T
4. (Hanford) should be (Los Alamos)
5. T
6. (joule) should be (erg)
7. T
8. (Dalton) should be (Chadwick)
9. T
10. (Oak Ridge) should be (Hanford)
11. (U-238) should be (plutonium)
12. T
13. (plutonium) should be (actinium)
14. T
15. (fourth) should be (half)

KEY — PART III

1. $2,000,000,000
2. stoichiometry
3. two
4. Einstein
5. aggregation
6. plutonium
7. $E = MC^2$
8. isotopes
9. Roosevelt
10. Chadwick
11. uranium
12. neptunium
13. Crookes
14. nucleus
15. transmutation

KEY — PART IV

1. molecule
2. spinthariscope
3. electron
4. Geiger counter
5. photon
6. U-235
7. uranium
8. beta particles
9. erg
10. fission
11. chemistry
12. transmutation
13. pitchblende
14. matter
15. nucleus

KEY — PART V

1. molecule	6. atom	11. Fermi
2. atomic	7. chain	12. proton
3. neutrons	8. parachute	13. electrons
4. negative	9. thallium	14. uranium
5. nuclear	10. ionized	15. Nagasaki

KEY — PART VI

1. uranium	6. Becquerel	11. Smyth
2. hydrogen	7. lead	12. Planck
3. actinium	8. atoms	13. graphite
4. barium	9. Bohr	14. Rjukan
5. neutrons	10. hydrogen	15. magnesium

(Continued under Tests on page 23)

Problems and Projects

METAL ETCHING

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Waller High School

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The process of metal etching as treated in this article is well suited for high school and junior high school pupils. This work may be correlated with science, art, mechanical drawing, or chemistry. It has pupil interest and does not require much material. Besides etching the objects suggested in Figures 1 to 6, this type of etching may be done on book ends, napkin rings, stationery holders, tea or coffee pot stands, and the like. This process may be carried out in any laboratory, shop, or industrial-arts setup, because the tools required are common to all of them.

Tools, Materials, and Equipment

The tools required are: (1) snips, straight or curved; (2) a few metal files; (3) a sharp stencil-type knife or razor blade; (4) ruler; (5) drill press or hand drill; and (6) a 3/32- or ⅛-in. drill.

The necessary materials and equipment are: (1) nitric acid, dilute, 50 per cent solution; (2) masking tape or masking paper; (3) glass bottle or container for acid; (4) glass rod or straw; (5) cotton, clean cloths, or waste; (6) No. 2/0 steel wool; (7) polishing compound or white toothpaste; (8) ½-in. brush; and (9) a buffing wheel of the type shown in Figure 7.

The following sheet metals may be used for doing etching: (1) stainless steel, annealed, about .025 in. thick; (2) silver (silver from old utensils will serve the purpose); (3) aluminum or aluminum alloy about .025 to .032 in. thick; (4) 28 to 18-gauge brass or copper. Such aluminum alloys as 17ST or 24ST which have been anodized should first have the anodized coating removed with steel wool; otherwise difficulty may be encountered in etching the alloy. Also, some stainless steels will etch easier and quicker with acids that are stronger than a 50 per cent solution.

Preparing the Metal

Choosing a design is the most important part of the etching job. The design should be of a type that suits the material that is being etched, and it should be drawn up full size.

When a design has been chosen the metal is cut about 1/32 in. larger all around than the finished size of the object. The metal is filed to finished dimensions and rubbed with No. 2/0 steel wool. Emery cloth or crocus cloth may be used instead of steel wool.

After the metal has been cleaned with steel wool, the whole piece of metal is covered on both sides with one or two layers of masking tape or paper, making sure that the paper sticks perfectly to the metal. Next,

FIGURE 1. BRACELET - ABOUT 6" LONG AND 1" WIDE

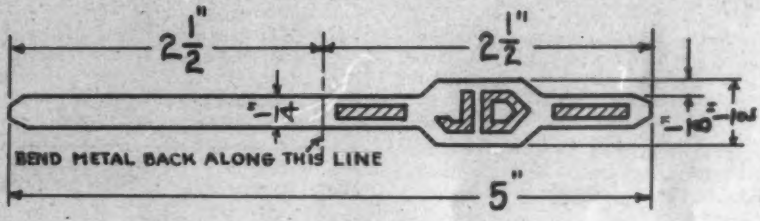

FIGURE 2. TIE PIN

FIGURE 3. MONOGRAM DESIGNS

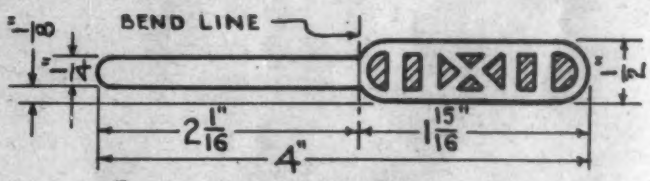

FIGURE 4. HAIR PIN

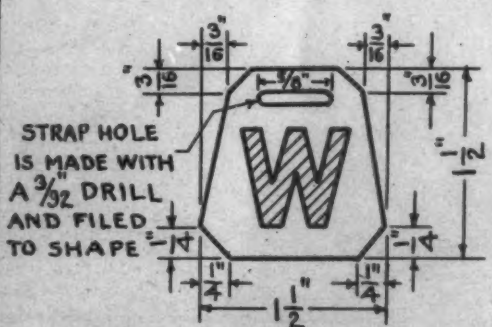

FIGURE 6. KEY TAG

FIGURE 5. WATCH FOB

TESTS

(Continued from previous page)

KEY — PART VII

1. spectrograph
2. Avogadro's
3. Hanford
4. California
5. Planck
6. Sneezy
7. spectrographs
8. Mendeleyeff
9. Compton
10. hydrogen
11. chain
12. beryllium
13. 146
14. 10
15. 10

KEY — PART VIII

1. hydrogen
2. plutonium
3. uranium 238
4. lithium
5. neptunium
6. helium

the design is traced upon the masking paper. Then that part of the paper bearing the design that is to be etched or eaten out is carefully cut away with a sharp knife or razor blade.

Etching

After the masking tape forming the design has been removed, a 50 per cent nitric acid solution is applied to the exposed metal with a glass rod or straw. Caution should be used in the handling of the acid, as nitric acid will burn the skin or clothes if it comes in contact with them. The instructor should make sure that the acid is kept in a labeled glass bottle and that it is covered when not in use.

The acid should remain on the metal as long as corrosion takes place. It is then removed from the metal by dabbing it with a piece of cotton or cloth. The etcher should continue to clean off old acid and apply clean acid until 6 to 12 applications have been applied. Each application should last from 8 to 12 minutes.

When the etching depth becomes noticeable, all the acid should be washed off with cold water. The masking tape is then removed with steel wool and the object is ready for polishing.

Polishing

If a luster is desired, it may be obtained by holding the metal against a revolving buffing wheel of the type shown in Figure 7, to

FIGURE 7. BUFFING WHEEL

which a polishing compound such as jeweler's rouge has been applied. If a polishing compound is not available, a plain white toothpaste may be used. A few drops of polishing compound are applied to the wheel at intervals.

After the polish begins to appear on the metal, a dry buffing wheel is used. It is suggested that the piece be held with pliers whose jaws have been covered with two layers of masking tape so that the pliers' jaws will not mar the polished surface.

If brass or copper is used for etching, the surfaces of the etched piece should be covered with a coat of clear lacquer or white shellac to prevent the metal from tarnishing.

ORNAMENTAL TIN CRAFT

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(Continued from page 459 of the December, 1945, issue)

Decorative Plate

A decorative plate possessing intricate piercing and doming makes a most attractive and useful tray. The design may be varied with reference to the size of the rim and the number of domes without affecting the appeal that this plate will have for the householder.

Forming of the tray or bowl portion of this plate may best be accomplished over a full-sized forming block. The wood, art metal hammer is the most useful for fitting the blank stock into the wood form. Double thickness of sheet tin plate should be built up for any plate or tray because single 30-gauge stock is too thin and flimsy.

Fig. 1. Decorative plate

This particular tray is difficult to make because each pierced area must be exactly alike; hence, there can be no error in laying out, cutting, or filing. When properly done, this is a most beautiful art-metal plate.

If desired, a piece of felt or other suitable fabric may be cemented on the base to protect a well-finished desk or table surface.

BILL OF MATERIALS

No. of pieces	*Item*	*Size*
2	Sheet tin	8½ x 8½
	Felt	5½ in. in diameter
	Solder, flux, steel wool, glue or cement for holding felt.	

Tools: Asbestos sheet, brush, carbon paper, copperplating setup, emery cloth, files, flat iron, forming block, heating device, jeweler's frame and blade, lead or wood block, lead weight, peening hammer, pencil, ruler, scriber, soldering copper, yellow tempera water color paint, and tin snips.

Procedure:

1. Use design as shown in the drawing, or develop original design.
2. Cut out 2 pieces of tin stock.
3. Solder one side of each piece.
4. Sweat both pieces together with hot flat iron. Weight the soldered parts together immediately as more is sweated.
5. Apply coat of yellow tempera water paint to one side of sweated piece for design transfer.

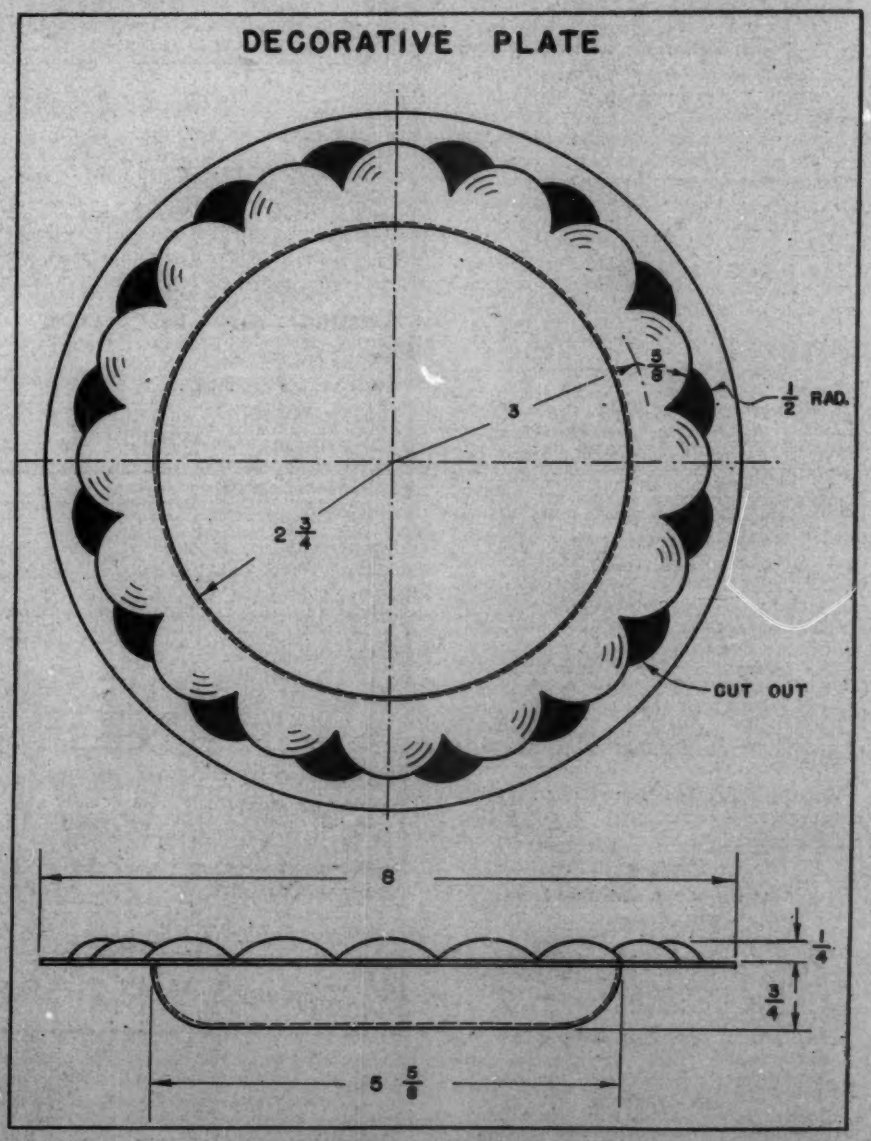

Fig. 2. Details of decorative plate

6. Lay design sheet and carbon paper on painted portion and trace design.

7. Cut out the outer design of the tray with tin snips.

8. Drill holes and pierce black areas.

9. File and dress edges with emery cloth.

10. Form center portion of tray over forming block to depth desired.

11. Perform necessary forming or doming of rim over special grooved block.

12. Peen flat surfaces of rim on lead or wood block, if desired.

13. Rub decorative plate with steel wool and prepare for plating.

14. Apply thick coating of copper.

15. Polish project with steel wool. Hold the project with a piece of cloth to prevent touching the metal with the hands.

16. Apply coat of clear metal lacquer and allow to dry.

HOW TO DRILL A HOLE IN GLASS

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The Bronx, New York

To make a drill for drilling a hole in glass, select an old triangular file that has outlived its usefulness. The size of the file will depend upon the size of the hole that is to be made. It is best to prepare several different sizes of files so that holes of different sizes may be made.

1. Place the file in a vise and allow about 2½ in. of it to project beyond the jaws of the vise. See Figure 1.

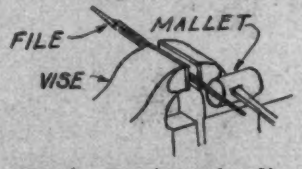

Fig. 1. Breaking the file

2. With a wooden mallet strike the file close to the jaws of the vise and the file will break off at this point. Several sizes of drills can be made from one file. Grind the sharp points off the broken edge, and also the teeth off the file for a distance of 1 in. from the point.

3. Grind the point of the file square as shown in Figure 2.

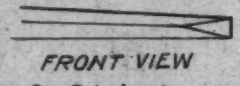

Fig. 2. Grind point square

4. Next grind the back of the file so that the point takes the shape of a chisel. See Figure 3.

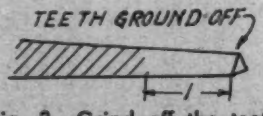

Fig. 3. Grind off the teeth

5. Then grind the chisel edge so that it has a rake of 15 deg., as shown in Figure 4.

6. Whet the chisel edge so that it is sharp. The drill should be whetted after each hole that is drilled.

Steps in Drilling the Hole in the Glass

1. Place the drill in a bit brace.

2. Locate the position of the holes on a piece of paper of the exact size of the glass.

3. Place the glass on top of the paper so that the position of the holes can be seen. The drilling must be done on a solid surface.

4. Place a few drops of turpentine where the hole is to be drilled.

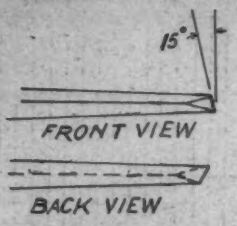

Fig. 4. Forming the edge

5. Then put the drill in position and begin to rotate slowly, using little pressure. You will soon feel the drill cutting. See Figure 5.

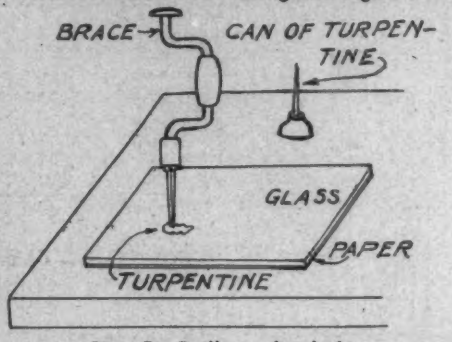

Fig. 5. Drilling the hole

6. Apply turpentine several times during the operation.

7. To prevent the glass chipping on the other side, turn the glass over as soon as the point of the drill penetrates the glass, and finish drilling the hole from that side.

KINDS AND USES OF FILES

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California, Pa.

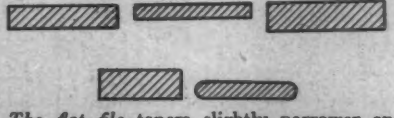
The kind of file is determined by the shape of the cross section. The most commonly used files in the general shop are listed here:

The square file is used for filing small, square, or rectangular holes, and for finishing the bottoms of narrow slots.

The round file is used for enlarging round holes and for finishing round corners. The smaller sizes are often called *rattail* files.

The three-square files are double cut on all three sides and the edges are very sharp. They can be especially valuable for finishing surfaces that meet at less than a right angle.

The half-round file is one of the most useful files in the general shop.



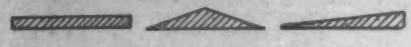
The flat file tapers slightly narrower and thinner toward the point and toward the heel. It is the most commonly used file in the shop.

The hand file is parallel in width with the faces slightly convex. It is a favorite file for finishing flat surfaces.

The mill file is a single cut file taking the shape of the flat file.

The pillar file is similar to the hand file except that it is narrower and thicker.

The crochet file has both edges rounded. It is very useful when filing against a filleted shoulder or a rounded corner of a hole.



The warding file is a very thin file. It is usually used for making slots and notches.

The barrette file takes the shape of a three-square file. It is a very useful file for finishing angles less than 60-deg.

The knife file is used instead of a barrette file in similar work where a thinner cross-section is most needed.

Files are classified as to their coarseness and fineness. The six most commonly used cuts are: rough, coarse, bastard, second cut, smooth, and dead smooth. Small files are classified as to numbers. They start at 00, 1, 2, 3, 4, 5, 6. Double nought is the coarsest, and number 6 the smoothest.

Files are grouped into two major classifications as to their cut. A single-cut file has teeth forming parallel rows. A single-cut file makes a smoother cut than the double-cut file, and should be used for fine work and for lathe filing.

Double-cut files have two rows of teeth crossing each other forming a series of sharp points. This type will remove more metal than a single-cut file.

Selecting the Correct File

1. For heavy rough cutting, use a large coarse double-cut file.

2. For finishing cuts use a second cut or a smooth single-cut file.

3. When filing cast iron start with a bastard-cut file and finish with a second-cut file.

4. When filing soft steel start with a second-cut file and finish with a smooth file.

5. When filing hard steel start with a smooth file and finish with a dead smooth.

6. When filing brass or bronze start with a bastard-cut file and finish with a smooth cut.

7. When filing aluminum, lead, or babbitt use a vixen or a beaver file.

Four Distinguishing Characteristics of a File

1. Length.
2. Shape of cross section.
3. Type of cut — double or single.
4. Coarseness or fineness.

Example: 10-inch half-round double cut bastard file.

References

Burghardt, Henry D., *Machine Tool Operation* (New York, N. Y.: McGraw-Hill Book Co., Inc.).

Nicholson File Co., *A File for Every Purpose* (booklet) (Providence, R. I.: Nicholson File Co.).

PERCENTAGE GRAPH

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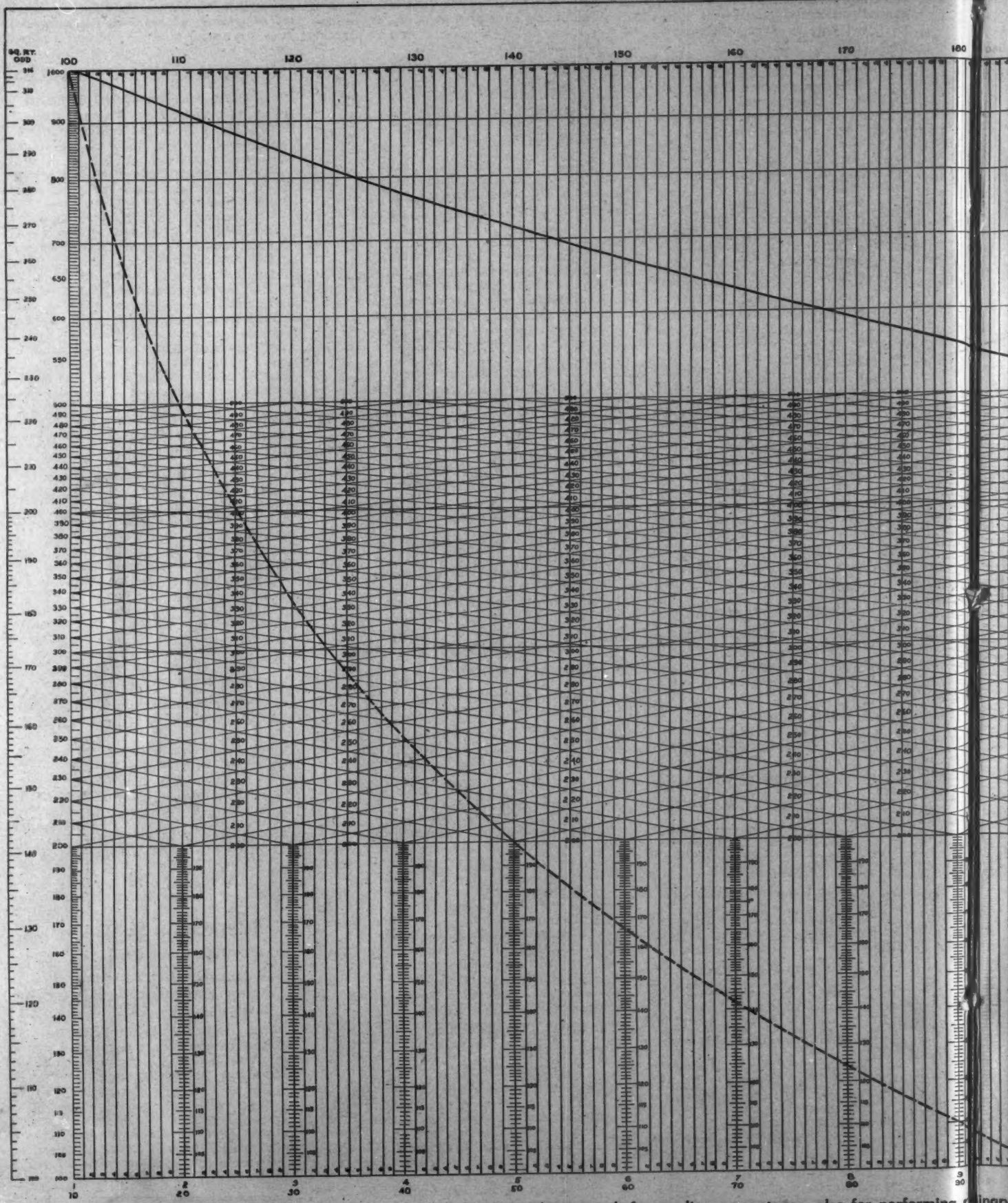
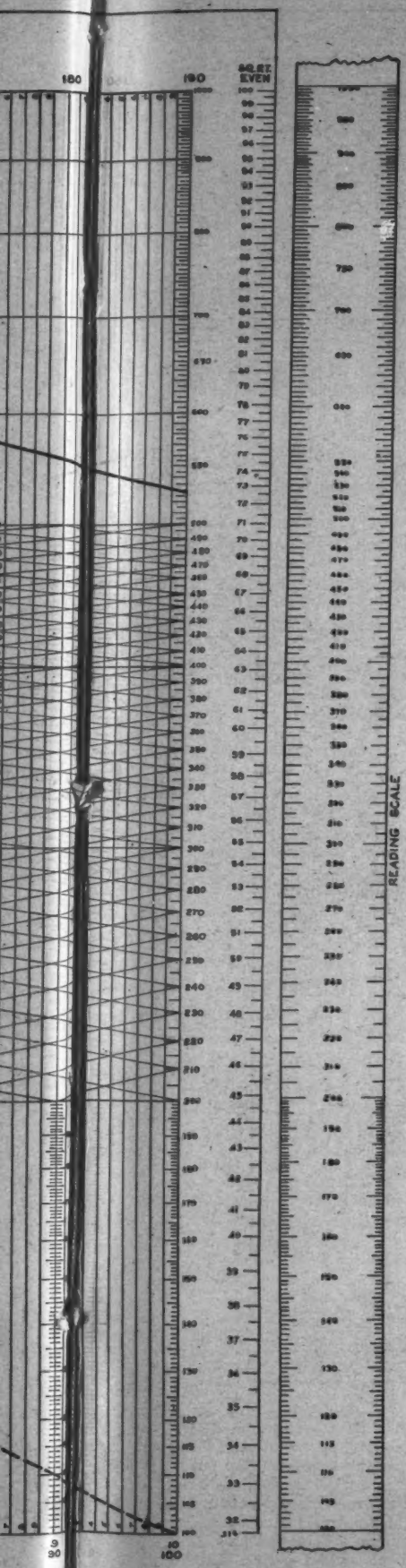
The problem of keeping individual percentages of absenteeism in several industrial plants was brought to our attention several months ago. As each employee's record must be kept and since scarcely any two are alike, the problem of computing percentages of absenteeism or attendance presents a tedious problem either of long-hand division or of slide rule determinations. We, therefore, devised the logarithmic graph shown herewith. Its use offers a great degree of accuracy and



Logarithmic graph for reading percentages; also for performing ordinary



rming ordinary slide rule computations

it is easily used because it is constructed for the specific purpose of computing percentages.

The logarithmic curve shown in Figure 1 represents the ratio of 1 to any number X; or the percentage expressed by the fraction $1/x$. These percentages are laid off on the vertical lines (or ordinates) to logarithmic values from the base, and the X values are laid off as horizontal distances from the origin in simple equal numerical divisions. If any number Y be multiplied by $\frac{X}{1}$, the product will represent the percentage that Y is of X.

With an ordinary flat scale laid off the same as the vertical logarithmic scale on the ordinates of the graph and by simply setting either index of the flat scale on the graph and reading on the logarithmic ordinates opposite the value Y on the flat scale, we have the value $\frac{Y}{X}$ or the required percentage.

The dotted curve represents the quotient of one divided by all natural numbers between one and a hundred. The full curve represents the quotient of one divided by all the natural numbers between a hundred and one hundred and ninety. We use these values because the problem presented to us was to cover records for 180 days.

flat scale extends to the left, there will simply be as many whole units in the product as there are in the sum of the two factors, X and Y. Of course, the value of $\frac{Y}{X}$ can never be greater than one, for it must be multiplied mentally by 100 to obtain the percentage of absenteeism or attendance and one's presence or absence cannot be more than 100%.

The value $\frac{1}{X}$ when lying between one and ten will have zero whole units, when lying between ten and a hundred will have minus one (—1) whole units, and when lying between a hundred and one hundred and ninety will have minus two (—2) whole units. The value Y can have one, two, or three whole units according as it lies between one and ten, ten and a hundred, and a hundred and one hundred and ninety, respectively.

Typical examples follow and are shown diagrammatically in Figure 2. Suppose an employee could have worked 85 days but was absent 12 days. Simply set the left hand index of the flat scale on the dotted curve at the

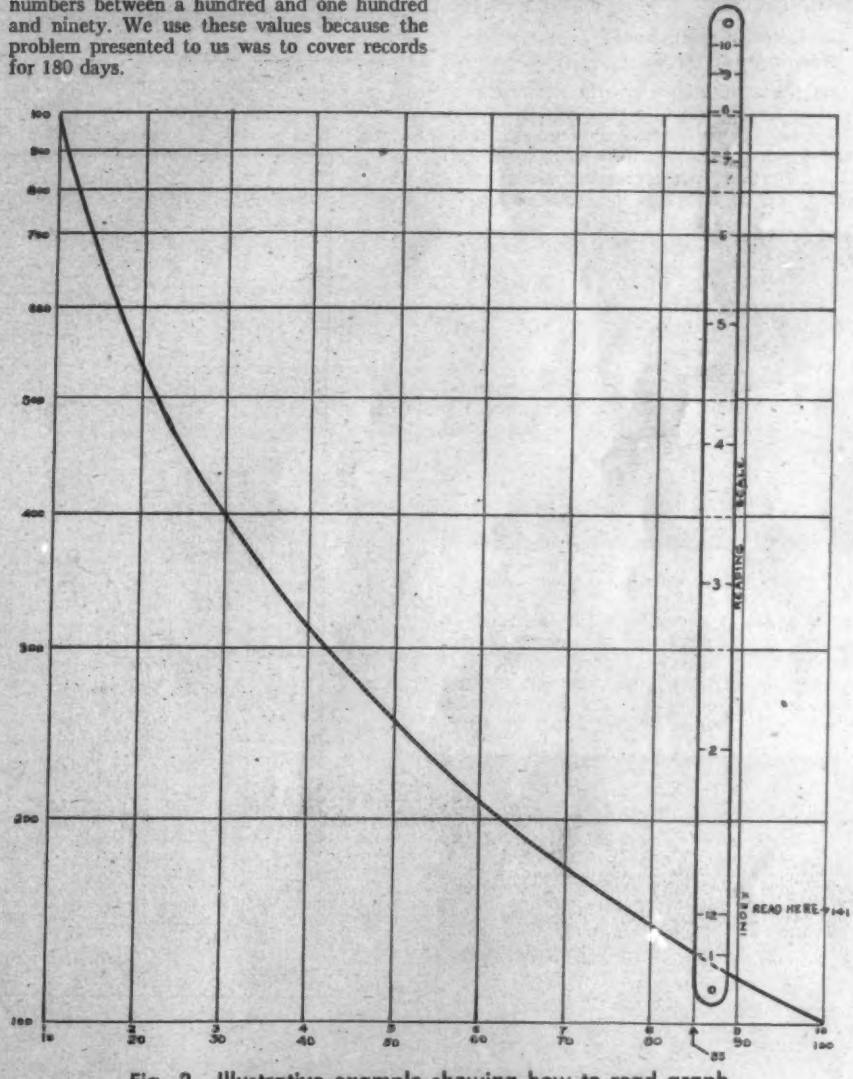


Fig. 2. Illustrative example showing how to read graph

The placement of the decimal is a simple process and operates the same as for the ordinary slide rule; that is, if the slide (or flat scale) extends to the right when set, then there are as many whole units in the product as there are in the sum of the factors—less one. If the

eighty-fifth horizontal division and read on the ordinate scale opposite 12 on the flat scale and we have 141 because there are —1 units for

85 (lying between 10 and a hundred) and two whole units in 12. The flat scale extends to the right so —1 + 2 = 1, less 1 = 0 or no whole places in the result .141. Now multiply by 100 and the percentage is 14.1 per cent. In like manner any percentages falling in the described limits can readily be determined more accurately and quickly with a little practice than with an ordinary slide rule.

We have arranged a scale on each side parallel to ordinate scales for finding square roots on left side, marked "sq. rt. odd" (for finding square roots of numbers with an odd number of whole units), and on the right side marked "sq. rt. even" (for finding square roots of numbers with an even number of whole units). Simply read the number on the regular scale and the root on the expanded or outside scale.

This problem was assigned to us as a research problem in our regular drafting course and more specifically with our related mathematics in the study of logarithms.

RAISING ALUMINUM CUPS

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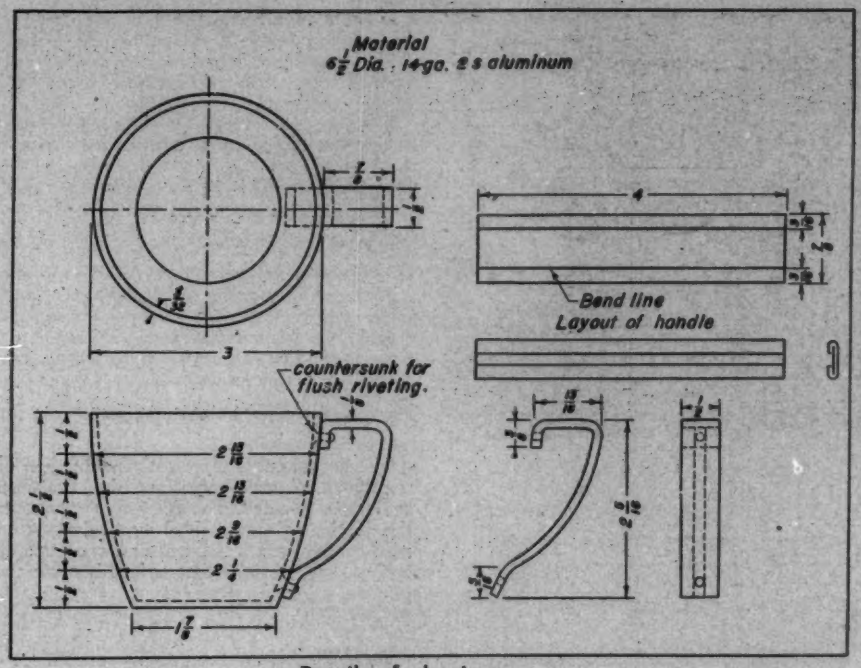
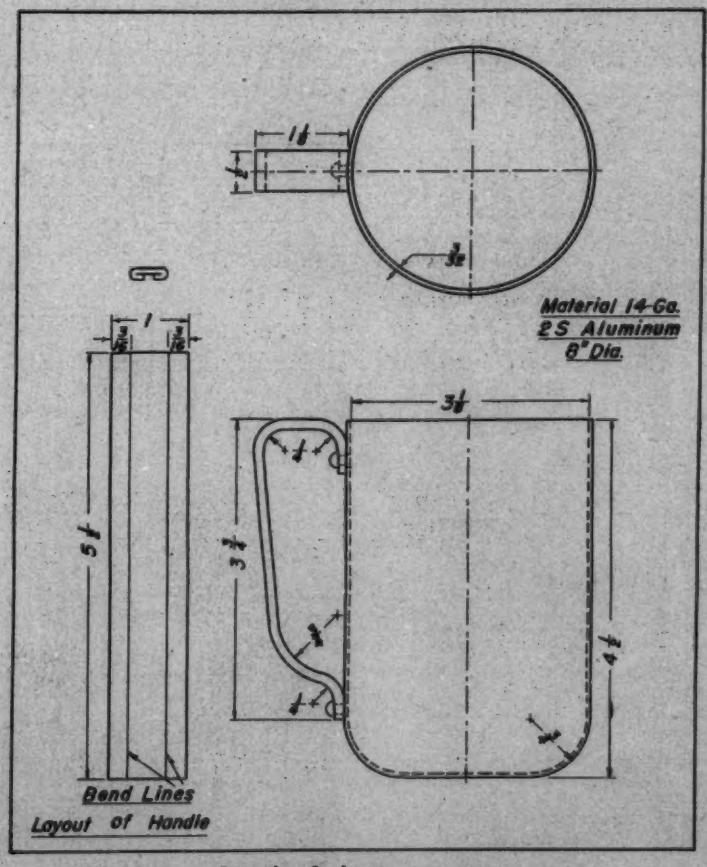
One phase of industrial arts aims to give students an opportunity to work creatively with industrial materials. Aluminum is a material which is relatively new in many metal shops. However, the increasing use of aluminum and its alloys in industrial and consumer products necessitates the inclusion of units on aluminum in the metalcrafts course. Because of its light weight, silvery color, resistance to corrosion, and the nontoxic and easy working qualities of 2SO(pure) aluminum, it is particularly well suited for fabrication of beverage sets, by hand or machine. The high conductivity of heat by aluminum limits the use of cups to cool liquids.

Spinning aluminum

Aluminum cups



Details of aluminum cup



Details of aluminum mug

Students usually want to make several cups; thus, through repetition they acquire speed and develop skill in the execution of various operations. Each student is encouraged to sketch or draw an original design indicating the lines, proportion and size of the cup he plans to make. Another approach to the design of the cup is to let the shape develop out of the working of the metal. This method is recommended for the experienced student. The diameter of the blank is estimated by adding the maximum diameter and the height.

The informational content of the job may include safe work habits, the production of aluminum, its uses, characteristics, alloys,

A spun mug

melting point, annealing, finishes, methods of marketing, commercial forms, principles of design and the implications of monopoly production of the material.

The student should learn to form the cups with a raising hammer on a stake or on forming blocks, as well as by spinning on a lathe. Fine steel wool moistened with hot water and soap produces a satisfactory finish. The accompanying designs may be formed either with the raising hammer or by spinning. The plan of procedure for each method is outlined.

Raising With Hammer

1. Sketch design.
2. Select the alloy and gauge most suitable.
3. Calculate the size of blank needed.
4. Lay out blank with dividers.
5. Cut to the line with tinner's snips.
6. Select a stake and raising hammer.
7. Form by means of the raising hammer.
8. Anneal when hard; quench in water.
9. File the top edge.
10. Anneal and plannish.
11. Lay out, bend, and plannish the handle.
12. Lay out, center punch, and drill holes in cup and handle.
13. Countersink holes inside the cup for flush riveting.
14. Finish with No. 2/0 steel wool and hot soapy water.
15. Evaluate.

Spinning

1. Sketch the full-sized design.
2. Turn the hardwood form on the spinning lathe.
3. Calculate the size of the blank.
4. Select a suitable alloy and gauge.
5. Lay out the blank, cut to the line with tinner's snips.
6. Center the blank between the form and the follow block.
7. Lubricate the blank.
8. Seat the blank on the form with a hardwood spinning tool.
9. Trim the edge with a cutoff tool.
10. Anneal the blank when hard.
11. Complete forming the metal to the form.
12. Trim the top edge.
13. Plannish the entire surface with a steel plannishing tool. Do not force the metal too tightly to the form.
14. Finish the surface with steel wool impregnated with soft soap, while revolving on the lathe.
15. Lay out, bend, and finish the surface of the handle.
16. Lay out, center punch, and drill the holes in the handle and cup.
17. Countersink the inside of the holes in the cup.
18. Rivet the handle to the cup.
19. Wash in hot soapy water.
20. Evaluate.

NAPKIN RING

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One of the most popular art metal projects in my shop is the napkin ring shown in Figure 1. This project is one that provides ample opportunity for correlation. The simple formula $\pi \times D =$ circumference means very little to a youngster until he really makes a practical application of the same. This is done when he has to figure out the amount

Fig. 1. Hammered napkin rings

of copper necessary to make the belt. The chemistry of fluxes, methods of finishing, annealing of copper, all fall in line with correlation.

This project also provides the pupil with a variety of experiences. Some of them are: original design of napkin ring, cutting with jewelers' saw, shaping, drilling, cross peening, and sweat soldering.

Procedure:

1. Develop design and transfer to copper.
2. Cut out with jewelers' saw.
3. Drill holes.
4. Cross peen the project.
5. Solder the tip on reverse side for about ¾ of an inch.
6. Shape over round stake or pipe.
7. Push tip through opening and shape like belt.
8. Sweat solder the job.
9. Shape the loop and prong and sweat them in place.

(Loop is not cross peened. It is left plain for engraving an initial.)

10. Steel wool and then buff with tripoli and rouge.
11. If you wish a high polish, finish with clear lacquer.
12. If an old English finish is desired, antique with liver of sulphur, and finish with steel wool for high lights. Then wax.

UTILITY SHEET-METAL BOAT

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Senior High School
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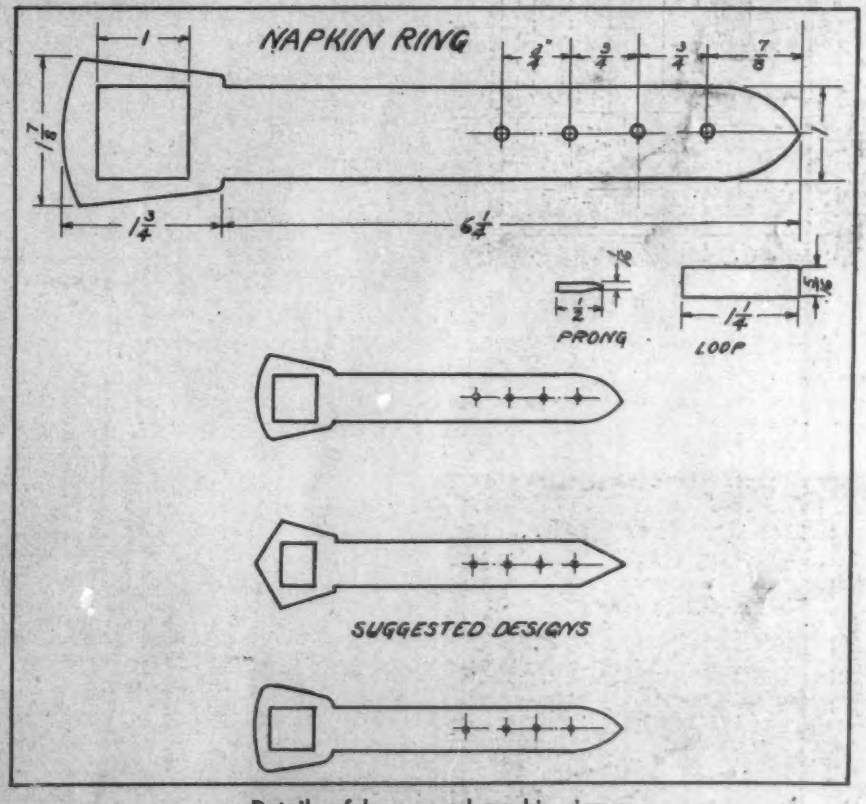
The sheet-metal boat described in this article was designed in the vocational sheet metal shop of the Senior High School, Decatur, Ill. This boat, while within the ability of the average vocational student, has a great deal of interest and appeal for the advanced student or the journeyman sheet-metal worker.

A one-quarter scale model made from these plans makes a very good problem and an excellent practice job to precede the construction of the full scale boat. The completed



Details of hammered napkin ring

Tools and Materials:

A. One piece of 18-gauge, 2 by 8-in. copper. Nickle, silver, or brass may be substituted.

B. Scratch awl, ruler, jewelers' saw frame and blade, round stake, cross-peen hammer, mallet, pliers, and soldering copper.

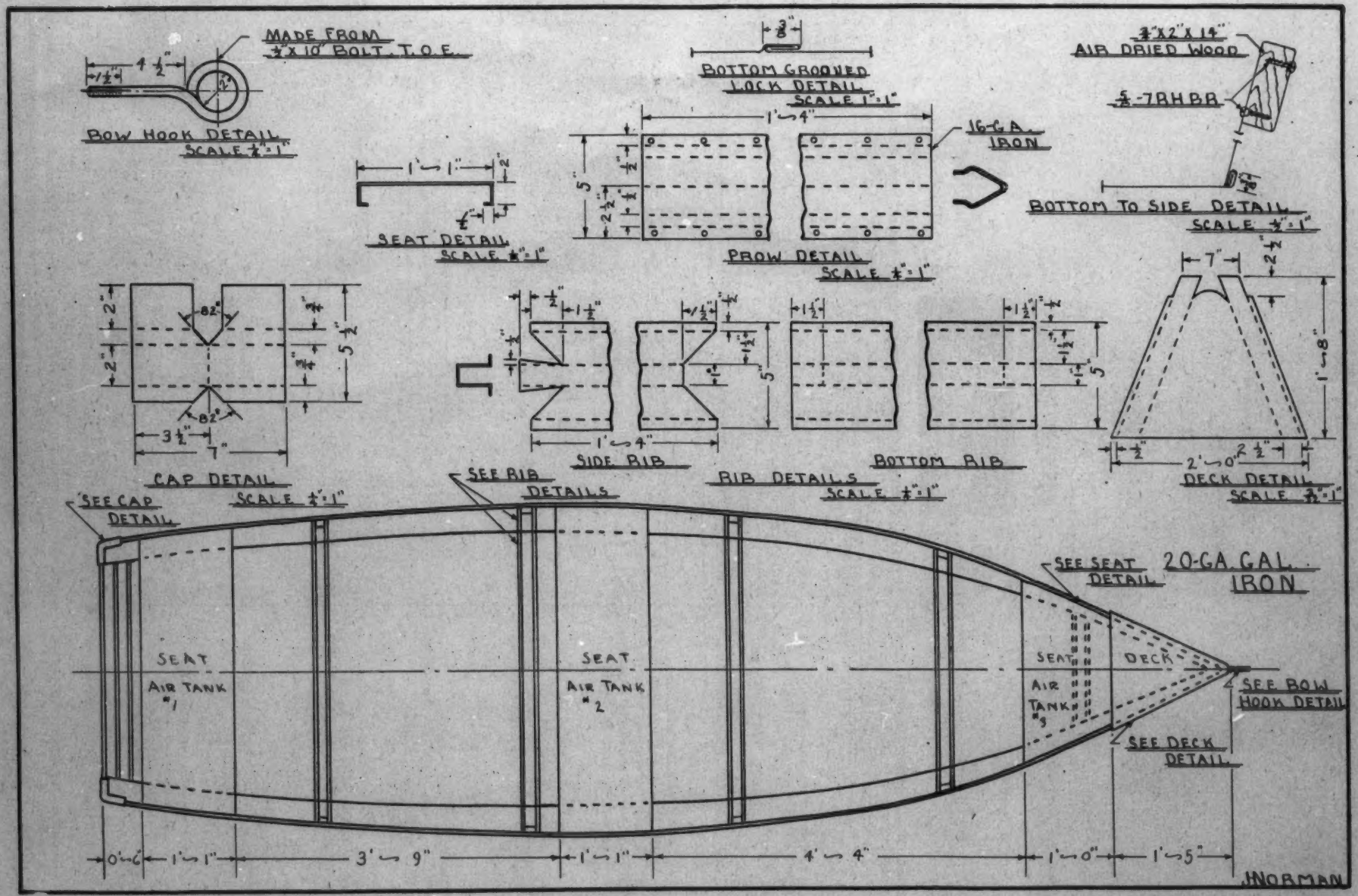


Fig. 1. Details of sheet-metal boat

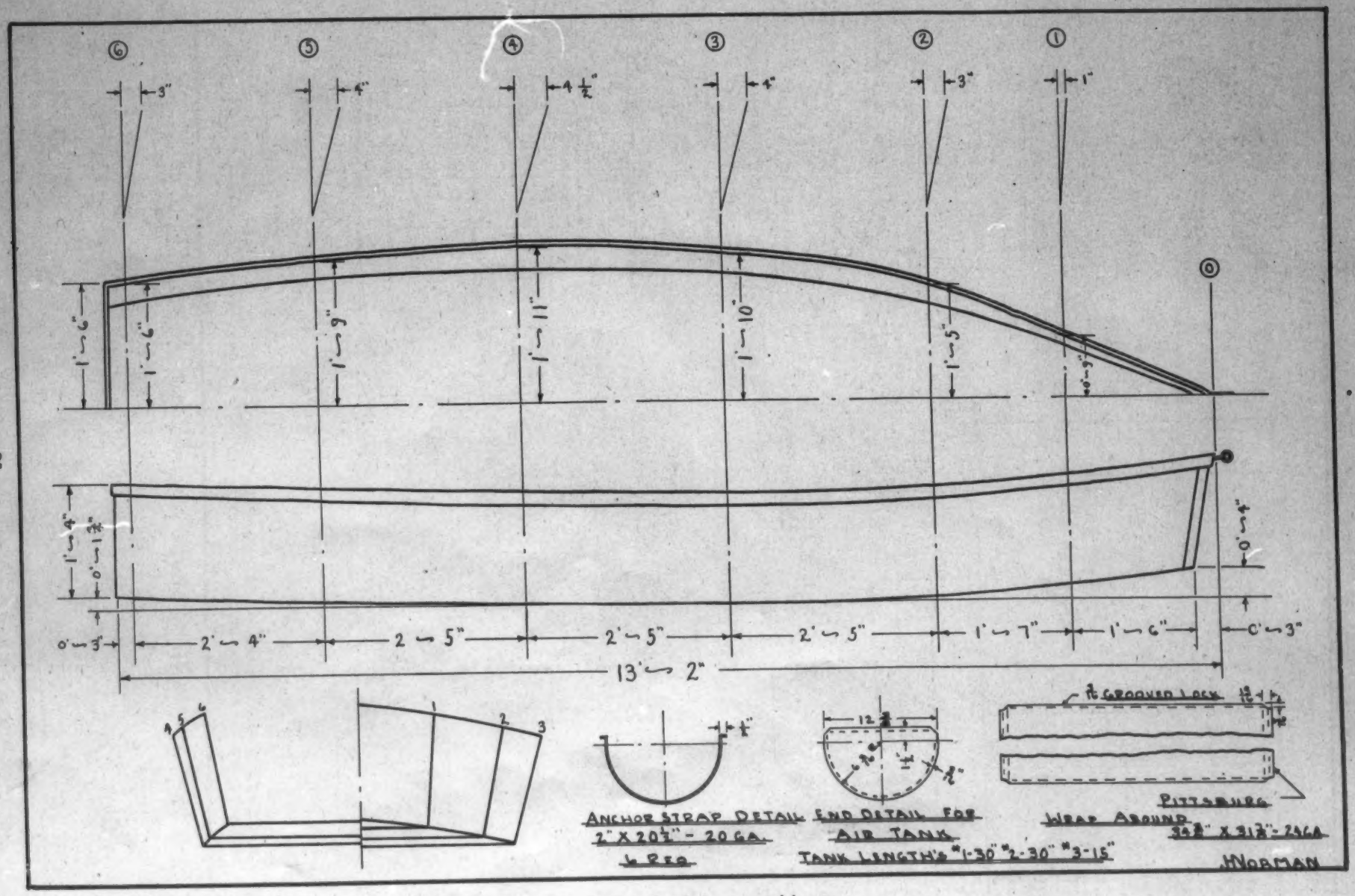


Fig. 2. Details of sheet-metal boat

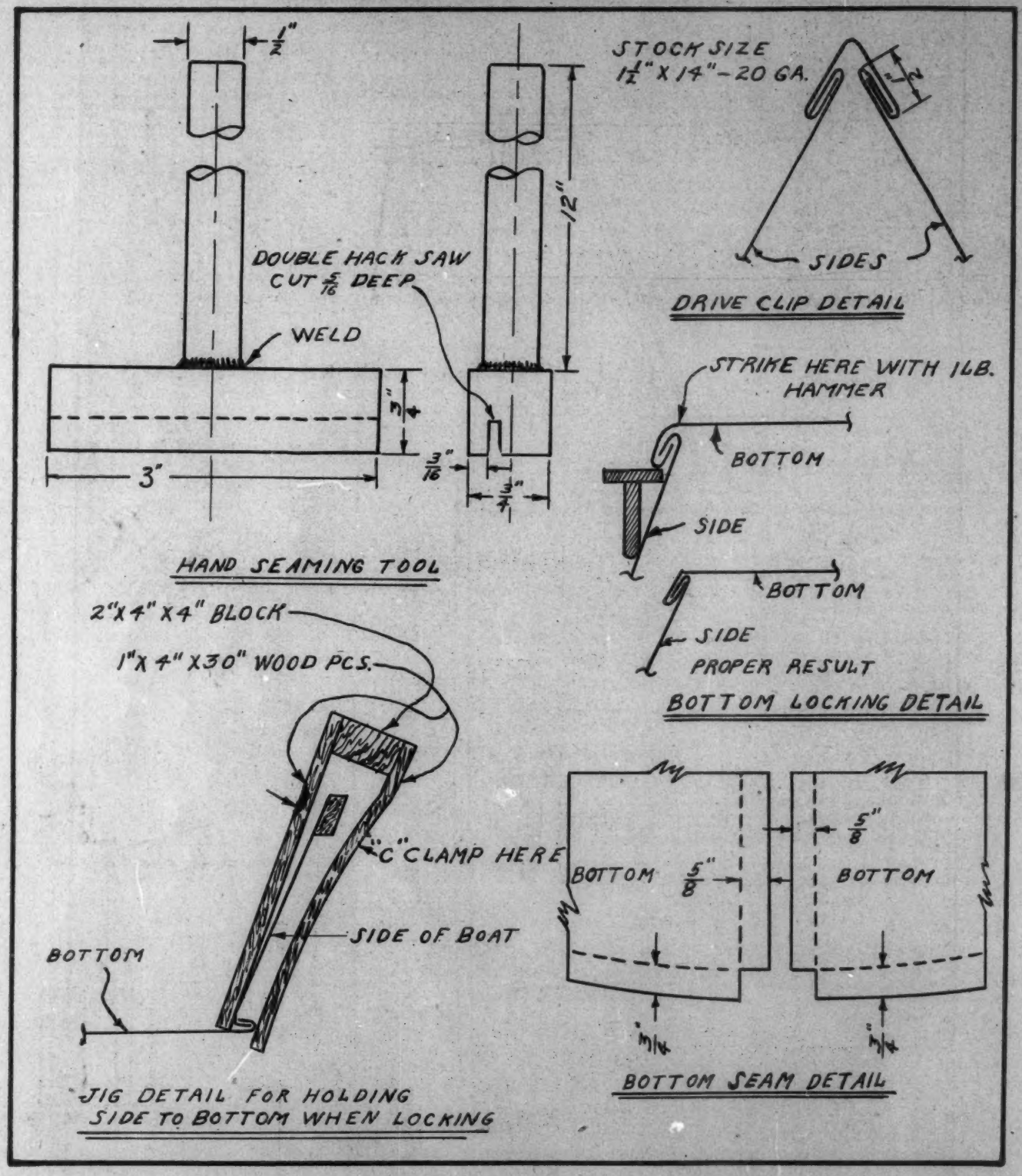


Fig. 3. Seaming details

boats have proved to be very satisfactory on local lakes and streams. They handle with ease with either oars or outboard motor.

Begin the construction by cutting the sheets for the bottom out of 20-gauge galvanized iron 30 in. wide. The sheets are laid crosswise so that the width of the bottom determines the length of the sheet.

Lay the cut sheets out on the floor and lap each sheet 1¼-in., to allow for forming the ⅜-in. grooved lock seam.

Lay out a center line from front to back on the iron for the bottom. From this center line measure off to the right and left at *stations* 0 through 6. This will determine the shape of the bottom. Connect the points with a curved line completing the bottom outline. To this bottom outline add ¾-in. to provide material for locking sides and bottom. See Figures 1 and 3 for bottom seam details.

Add ¾-in. to the back sheet on the bottom layout to allow material for locking bottom to the back. Scratch out all allowances on all bottom parts and cut out all relief corners. See bottom seam detail in Figure 3.

Lock all parts of bottom together with a

Fig. 4. The boat ready for launching

¼-in. grooved lock seam. Secure each lock seam by riveting through the lock near each end. Use a 3 or 4-lb. flathead tinners' rivet.

The sides are cut out of 20-gauge galvanized iron, 20½-in. wide. The over-all length of the sides are 13 ft. 5¾-in., which includes ¾-in. for locking sides to back and ½-in. for drive cleat at the front. The number of pieces required to make up the sides will depend on the length of material available. Additional allowances must be made for joining the side pieces.

Braking for the bump rail and lock seam for the bottom should be done before side parts are locked if there is no 14-ft. brake available. Note the bottom to side detail in Figure 3.

The air dried wood filler strip should be placed and fastened with screws. See the detail in Figure 1. The back is locked to the sides and bottom with a ⅜-in. lock in the same manner as the bottom and sides. Form the rear bump rail and encase the air dried filler wood strip before locking the back in place.

Since the lock between the bottom and sides is a curved line, the ⅜-in. open fold on the bottom will be made with a hand tool. See details for a handmade seaming tool in Figure 3. This tool is heavy duty and works very well on this job.

With the open folds prepared on both the sides and bottom, the locking of sides and bottom is next. At this point care must be taken to keep complete control of the seaming operation. See the jig for holding side and bottom in place while locking, in Figure 3. Use a heavy dolly and a 3 or 4-lb. hammer when setting up the bottom seam. Keep the seam thinned as it is set to prevent slipping. Note the detail on the procedure shown in Figure 3.

After both sides are locked to the bottom pull the sides together and drive the drive clip in place at the front. See drive-clip detail in Figure 3.

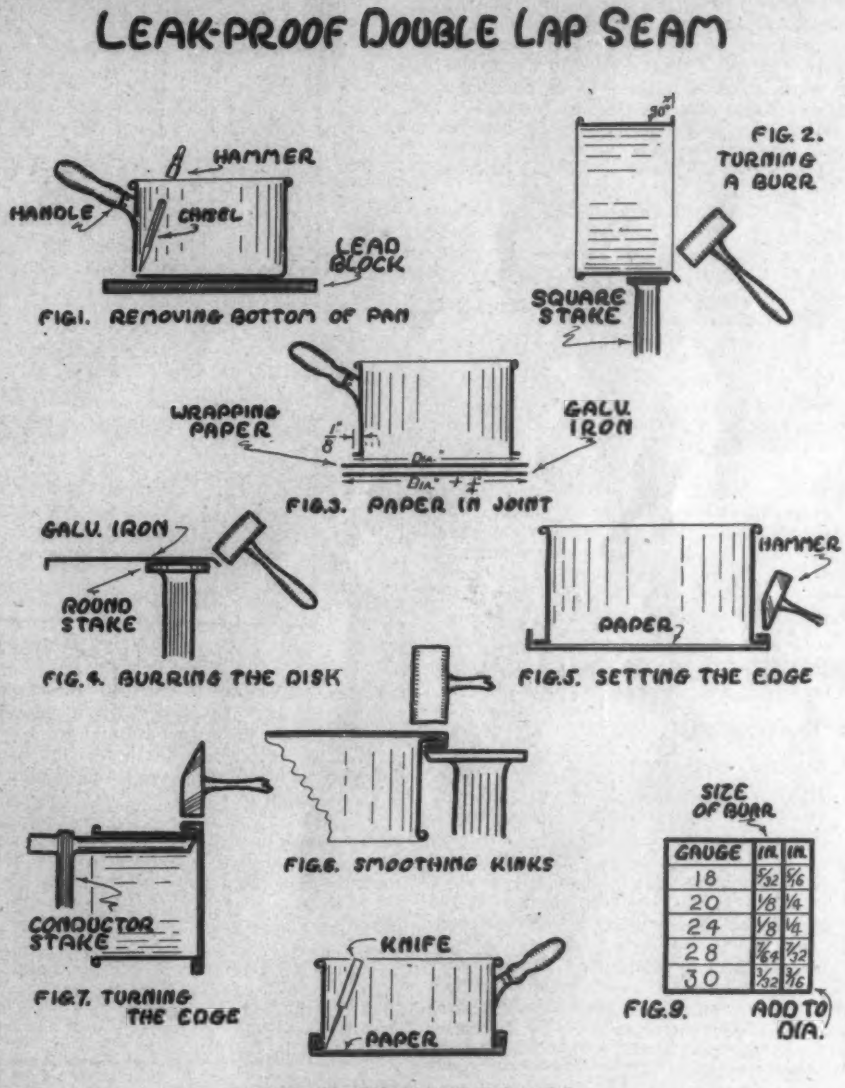
Wood strips 1 by 4 in. can be sawed to length and used to spread the sides to the correct position while seats and ribs are installed.

With the foregoing completed, the seats, ribs, and deck can be installed in any order desired.

The ribs are formed on the brake, riveted, and sweat soldered to the boat. Where possible the ribs should cover the seams in the bottom for added strength and appearance. See rib detail drawing in Figure 1.

Angle irons (1 by 1 by 10 in.) are bolted to the inside of bump rail to support the seats. The detail for forming the seats is shown in Figure 1.

All exterior seams must be sweat soldered to prevent possible leaks.



The prow is 16-gauge iron shaped and bolted over the drive clip to prevent damage to the front. The prow detail also is shown in Figure 1.

Most city owned lakes require safety tanks to prevent sinking in case of accidents. The tanks here shown in detail fit under the seats. The total buoyancy is 270 lb., which is more than is generally required.

The tie ring is made from a ½ by 10-in. bolt formed and welded as shown in Figure 1. The threads should be kerfed after it is in place to prevent removal.

Finishing may be as desired. Be sure that any paint or enamel used is intended to be used over metal. A generous wash of acetic acid or common vinegar before painting will help to make the paint stick.

LEAKPROOF DOUBLE LAP SEAM

R. W. SWINYARD

Student, State Teachers College
Oswego, New York

Double lap seams are usually soldered to make them leakproof, but occasionally the shop instructor meets with difficulty when attempting to join any metal which does not solder easily, for example, aluminum. Therefore, the making of a leakproof double lap seam, without the use of solder, has been a source of much concern on the part of the instructor. This article aims to reveal a simple way to make this leakproof joint, which can be used to join two unlike metals, as well as metals which will not solder easily.

It proves to be a very handy method for repairing cooking utensils. Although the same method may be used on containers of various shapes, only the cylindrical shape is shown here, the example being an aluminum pan.

Removing the Bottom from an Old Pan: Cut the bottom from the pan with a cold chisel, as shown in Figure 1. Use a lead block to support the pan in this operation. File the edges smooth and square.

Burring the Pan: Turn a 90-deg. burr on the edge of the pan, either by machine or by hand. Figure 2 shows the hand method of using a mallet over a stake. Refer to the table in Figure 9 in selecting the proper dimension for the burr. This dimension, of course, depends upon the thickness of the metal in the pan.

Making the Joint Leakproof: The secret of the leakproof joint is shown in Figure 3. The heavy wrapping paper disk is made exactly the same size as the galvanized iron disk. The dimensions may vary slightly, according to the thickness of the metal used. Refer to Figure 9 for the amount to add to the diameter when calculating the size of the disks. Figure 3 shows sizes for 20-gauge metal.

Burring the Disk: Turn a 90-deg. burr on the galvanized iron disk by machine, or by hand as shown in Figure 4. A ⅛-in. burr is shown for this particular gauge metal.

Setting Down the Edges: Place the heavy wrapping paper disk between the galvanized iron disk and the pan, and set down the edges of the pan with a setting-down hammer as shown in Figure 5. Irregularities of the joint may be smoothed out by the use of a mallet over a stake, as in Figure 6.

Turning the Edge of the Joint: Figure 7 shows the use of a setting-down hammer in turning the edge of the joint. A conductor or double seaming stake supports the pan in this operation. The joint should be hammered tight, but not so tightly as to cause the metal to crack or split.

Removing Excess Wrapping Paper: The final operation, that of cutting the excess paper from the pan with a sharp knife, is shown in Figure 8. The point of the knife must be held close to the joint. Test your workmanship by filling the pan with water.

RULING PEN MADE OF SALVAGED STEEL

P. L. BROWNELL

Omaha, Neb.

When two distressing conditions stare one in the face, it is time to do something about it. The conditions were these: (1) Ruling pens, of really high grade, were next to impossible to obtain, at any price. (2) Steel of the highest grade was being thrown on the junk pile. So why wouldn't it make sense to let the two facts combine forces?

The high grade steel was in the form of worn-out power-hack-saw blades. The pen desired was what is sometimes referred to as a *detail* pen, but often called by draftsmen a *border line* pen. Although this is one of the largest of common ruling pens, there seems no reason why the same method could not be used to make a smaller pen.

The steel in hack-saw blades of this type is so highly tempered that it is almost as brittle as glass. So to break off a piece of approximately the right length, just put it in the vise and tap it with a hammer.

The completed ruling pens made according to the accompanying instruction sheet will do as good work as any pen made. Furthermore, it has a better quality steel in the nibs than any but the most expensive pens of prewar days.

Method of Procedure

1. Break power hack-saw blade in vise, making two pieces approximately the length desired. See Figure 1.

2. Grind to within 1/16 in. of the desired width.

3. Anneal all except ends which are to be used for the nibs. Use any source of heat to raise the temperature of the steel to a cherry red. See Figure 2. Let cool slowly by placing on pile of ashes in furnace ash pit.

4. Mark center line for holes and mark the position of the holes with center punch, as shown in Figure 3.

5. Drill or punch 1/16-in. holes at the center punch marks.

6. Mark position of holes in second piece from those in the first.

7. Heat one of the pieces and bend as shown in Figure 4. It should be bent out of line at least 3/32 in.

8. Drill a 1/16-in. hole in a piece of soft steel 9/16 in. wide and 3/32 in. thick, 1/16 in. from the end. Cut off this end in a 90-deg. V, each point of the *V* to be 9/16 in. from the end. See Figure 5.

9. Cut end of black walnut handle to fit in *V*. See Figure 6.

10. Cut away each face of handle as far back from V steel as nib pieces will extend. Remaining *tenon* must be same thickness as V steel.

11. Place handle and V steel together with nibs in place. Put screw or temporary rivet through nibs and V steel. Mark for holes through tenon. Remove handle to drill.

12. Make six rivets of correct diameter. Use three of these for temporary riveting.

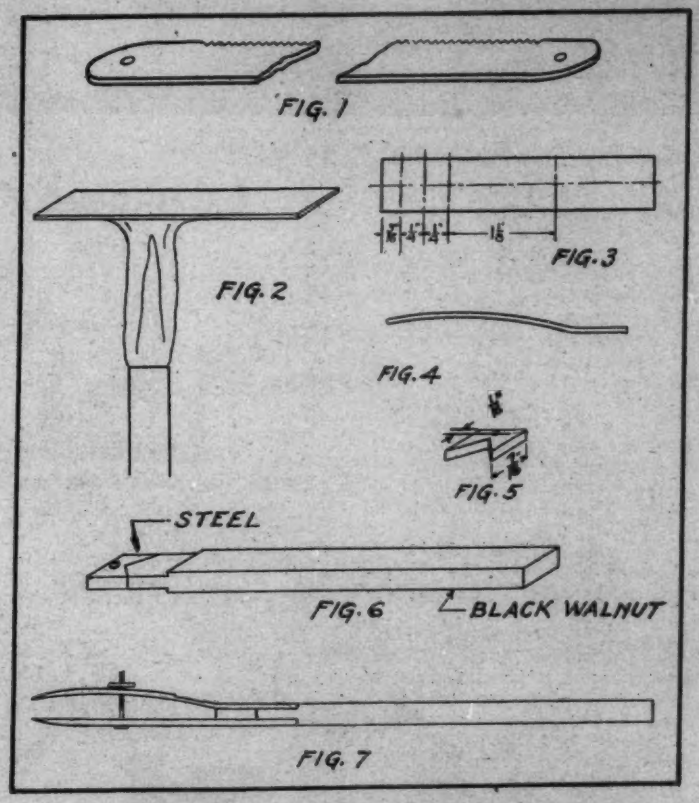
13. Finish grinding to correct pointed shape and desired width. Grind top of curved nib thinner at point directly in front of where it is attached to the steel. See Figure 7.

14. Take part, and countersink the rivet holes on outer faces of both nibs. Use a larger drill to do the countersinking.

15. Harden nibs by heating to cherry red and dipping in water.

16. Reassemble and do the riveting permanently. Grind heads of rivets down flush with surface.

17. Sharpen on oilstone and insert adjusting screw.



A ruling pen made of salvaged materials

USES OF ANIMAL GLUE

ANIMAL GLUE INFORMATION SERVICE

New York, N. Y.

Sizing and Coating

Rayon: Viscose, acetate, cupra, spun, slashing and finishing
Silk: Finishing
Cotton: Finishing
Wool: Sizing
Camouflage, cloth and net
Window shades: Cloth and paper
Rug and carpet: Sizing
Paper: Writing, bond, currency, map, blueprint, onionskin, coated, playing card, wallpaper, crepe, and twine
Hats: Straw and cloth
Wooden alcohol barrels
Printed advertising tape
Lacquer undercoat
Reed furniture
Gaskets: Fiber, asbestos, paper
Calcimines: Hot and cold water paints
Wall sizes
Grease and oil containers
Glass chipping
Decalcomania
Turpentine barrels
Paint containers

Adhesive

Abrasives: Paper, cloth, fiber, disks, sticks, wheels, belts, sleeves, and boards
Paper containers: Folding and setup boxes, spiral and convolute tubes, and heavy cartons
Luggage: Leather, canvas, rawhide
Wood: Furniture, desks, tables, chairs, caskets, cabinets, millwork, pencils, boxes, pattern-making, toys, and fishing rods
Musical instruments: Pianos, organs, woodwind, string, and accordions
Advertising displays
Paratrooper kits
Gummed paper and cloth: Stay paper, sealing and veneer tape, labels, envelopes, and multiple bags
Book and magazine binding: Backing, case-making, padding, and loose-leaf binders
Ammunition containers
Clarification: Water chemicals
Artificial flowers
Cork: Gaskets, closure caps, sheets, and insulation
Rubber: Tires, footwear, synthetic, and mechanical
Dolls: Display forms
Protective colloid in waterproofing emulsions
Moulage
Emulsifying agent
Leather dressing and polish
Graining rollers
Matches: Base, tip, striking, and abrasive
Duplicating compounds: Hectograph
Plastercast molds
Dyeing, bleaching, and cleaning compounds
Asbestos pipe
Fireworks
Emulsion stabilizer
Sandblasting: Protective coating
Leather belting
Iceproof labeling

Composition and Colloidal

Printers rollers
Wood composition: Heels, smoking pipes, and toys
Electrolytic metal refining
Ceramics
Picture frame and decorative molding
Artificial limbs

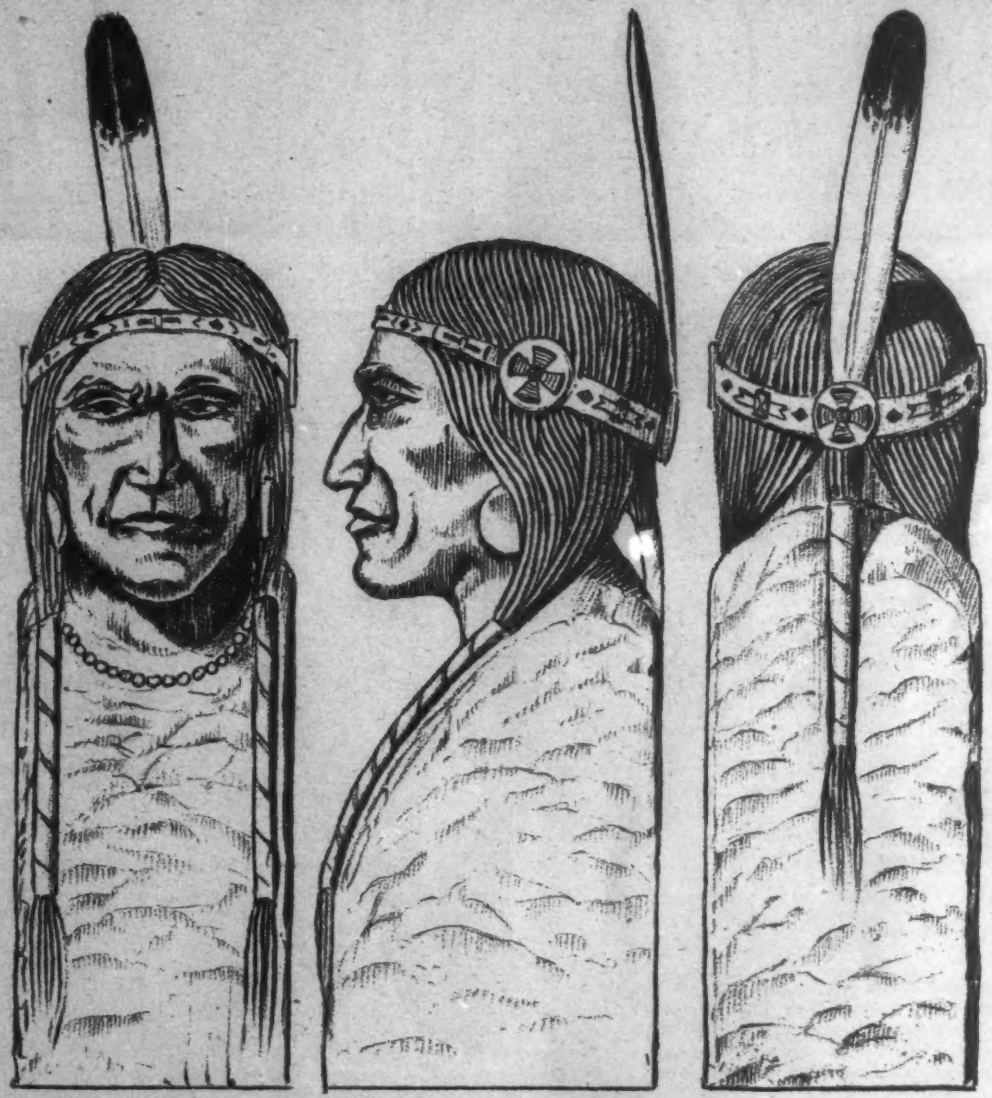


Fig. 198. Full-size pattern of Indian head

WHITTLING-JACKKNIFE TECHNIQUE

W. BEN. HUNT
Hales Corners, Wis.

(Continued from page 471 of the December, 1945, issue)

Indian Head

The Indian head shown in Figures 196 and 197 was whittled out of a piece of mahogany. Cherry, walnut, pine, and basswood also might have been used.

Start out as usual with the silhouette of the side view. Figure 198 shows full-size views which may be used as patterns. When ready to whittle the face set up a mirror where you can see your own face. Or look at another person and study his face as you proceed with the whittling. In this way you will see a lot of things that cannot be shown in drawings or photographs.

If the feather should break off, it is a simple matter to glue or cement another one onto the back of the head. The headband represents a beaded band such as the Blackfoot Indians wear. The hair is shown wrapped with cloth instead of being braided, but where there is no wrapping it is lined with fine V cuts, following the natural sweep of the hair. The neck beads were made with a small hollow nail set. A bear claw necklace might have been used and also would have looked good.

Whether the project is to be painted or not is a question that must be decided by the individual whittler. Some who saw the one shown in Figure 197 said they would have

Fig. 196. The Indian head after the whittling is done.

Fig. 197. The Indian head after it is painted

liked it unpainted. Others said it looks much better painted than unpainted. Well, that is just a matter of opinion. The head really looks nice either way.

To finish without paint, if it is of mahogany, give it a coat of filler to close up the pores. Then it can be stained in dark mahogany and waxed.

If you use cherry or walnut all you need do is to give it one or two thin coats of linseed oil, and after the oil is dry, wax the project.

Should you wish to paint it, start with the hair. A coat of black water color or waterproof drawing ink will take care of that. The head band is then painted white and after that the designs are put on in red, blue, black, and orange. The hair wrappings are a bright red and the shell ear pendants are white. The eagle feather is white with black tip. The face may be given a coat of dark mahogany stain, or it may be painted with reddish brown water color. The rest of the block may be left natural, as shown in Figure 197.

SCONCE

RUFUS JACOBY

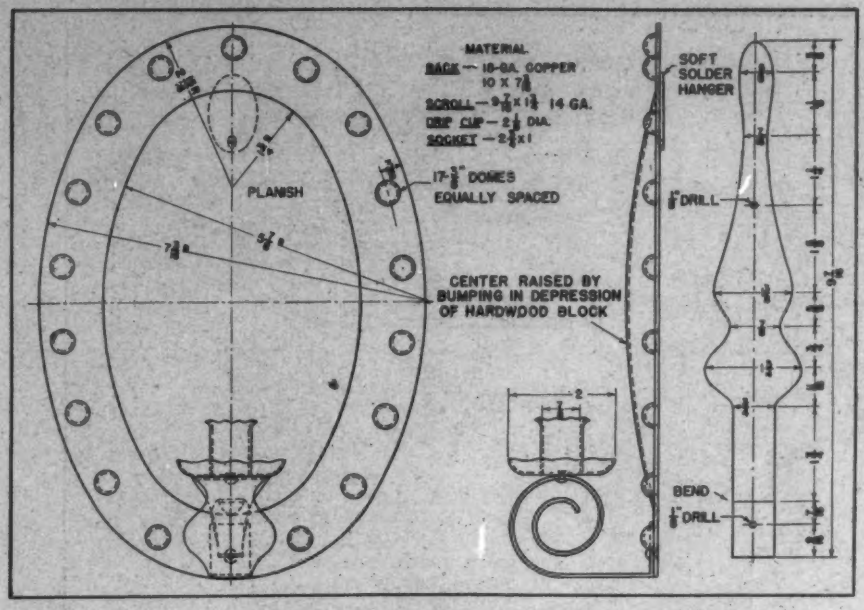
Coolidge High School
Washington, D. C.

The sconce provides a challenging job for the advanced metalcrafts student. This design was created for fabrication in copper; however, because of the availability of aluminum and the desirability of including work in aluminum in industrial-arts courses, the job may be adapted to be fabricated in 16-gauge aluminum.

The layout is made on the back of the blank to facilitate the raising of the center elipse and domes. The elipse may be raised on the edge of a hardwood block or it may be bumped into a depression gouged out of hardwood. The seventeen domes are punched with a 3/8-in. dapping punch and brass die. The domes cannot be completely punched in one operation, because the hardening of the metal as it stretches, will produce cracks around the edges of the domes. All the domes are punched 3/8-in. deep, then the job is annealed. After annealing the metal is punched to the bottom of the die, completing the operation. The hanger may be riveted or soldered to the back, to permit the sconce to rest against the wall.

Wrought metal sconces

The informational content of this job consists of (1) the characteristics of the material used that makes it suitable for making this design, (2) how the material is produced and sold, and (3) its industrial uses. The student must know the *why and how* of the manipulative operations outlined in the following plan of procedure.



Details of wrought metal sconce

1. Outline plan of procedure.
2. Draw full-size side view and plan of scroll.
3. Make bill of material.
4. Have steps 1, 2, and 3 checked and approved by the instructor.
5. Get out the stock.
6. Sand and steel wool the stock.
7. Ball peen the face of the stock.
8. Make the layout on the back.
9. Cut to line with snips.
10. File edges.
11. Gouge depression in hardwood to raise center elipse.
12. Smooth depression with sandpaper.
13. Raise center elipse over the depression.
14. Smooth raised portion with mallet on suitable stake.
15. Anneal.
16. Raise domes ⅜-in. with dapping punch and die.
17. Anneal.
18. Pickle.
19. Complete punching domes.
20. Cut out scroll with jewelers' saw, drill holes, and file edges.
21. Shape scroll to fit drawing of the side view.
22. Fabricate drip cup and socket, and rivet them to the scroll.
23. Rivet scroll to back.
24. Cut out and rivet or solder hanger to the back.
25. Finsh with No. 2/0 steel wool.
26. Wax.
27. Check and evaluate.

COLLAPSIBLE SLING BAG FOR SHOPPERS

SIMON S. PALESTRANT

Bronx, New York City

The paper scarcity coupled with the "carry-it-yourself" campaign has visited untold hardship on mother on her shopping tours. What with hanging onto her scattered, unwrapped purchases, and digging for her change, the aid of an octopus would be welcome to the mater. The collapsible sling bag described herewith will be a great help to her.

To make this bag cut three rectangles out of ¼-in. plywood as follows: The front panel 18 by 10 in., the back panel 22 by 10 in., the bottom panel 10 by 6 in. Hinge the bottom panel to the back panel so that the 10-in. edges meet and the bottom can fold flat against the back panel much in the manner of a closed book. Glue (and anchor with ¾-in. brass) the strips of ½-in. quarter round molding along the 10-in. end of the front panel. See that the flat ledge of the molding faces toward the other 10-in. edge of that front panel. Use weldwood or other waterproof glue throughout.

Drill a ⅝-in. hole 2 in. from each corner of both the front and the back panels — 8 holes altogether. Sand all of the pieces thoroughly, stain, and shellac (omit the stain if desired) to suit the taste.

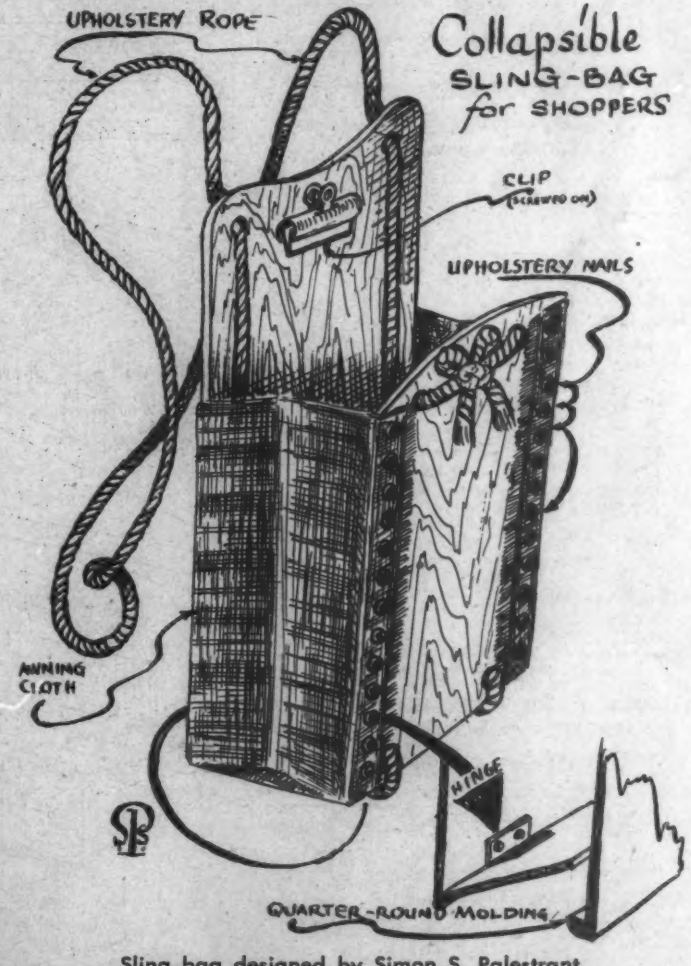
Select a piece of awning cloth (purchasable at an awning or window-shade shop) in gay colors and bold stripes. You will need a strip 46 in. long by 9 in. wide. Hem the ends and press them flat. Draw the long threads out about ½ in. to form a fine fringe all along both edges of the cloth.

To assemble the bag, glue the cloth along the face of the front panel surface opposite the molding so that it covers about 1 in. of

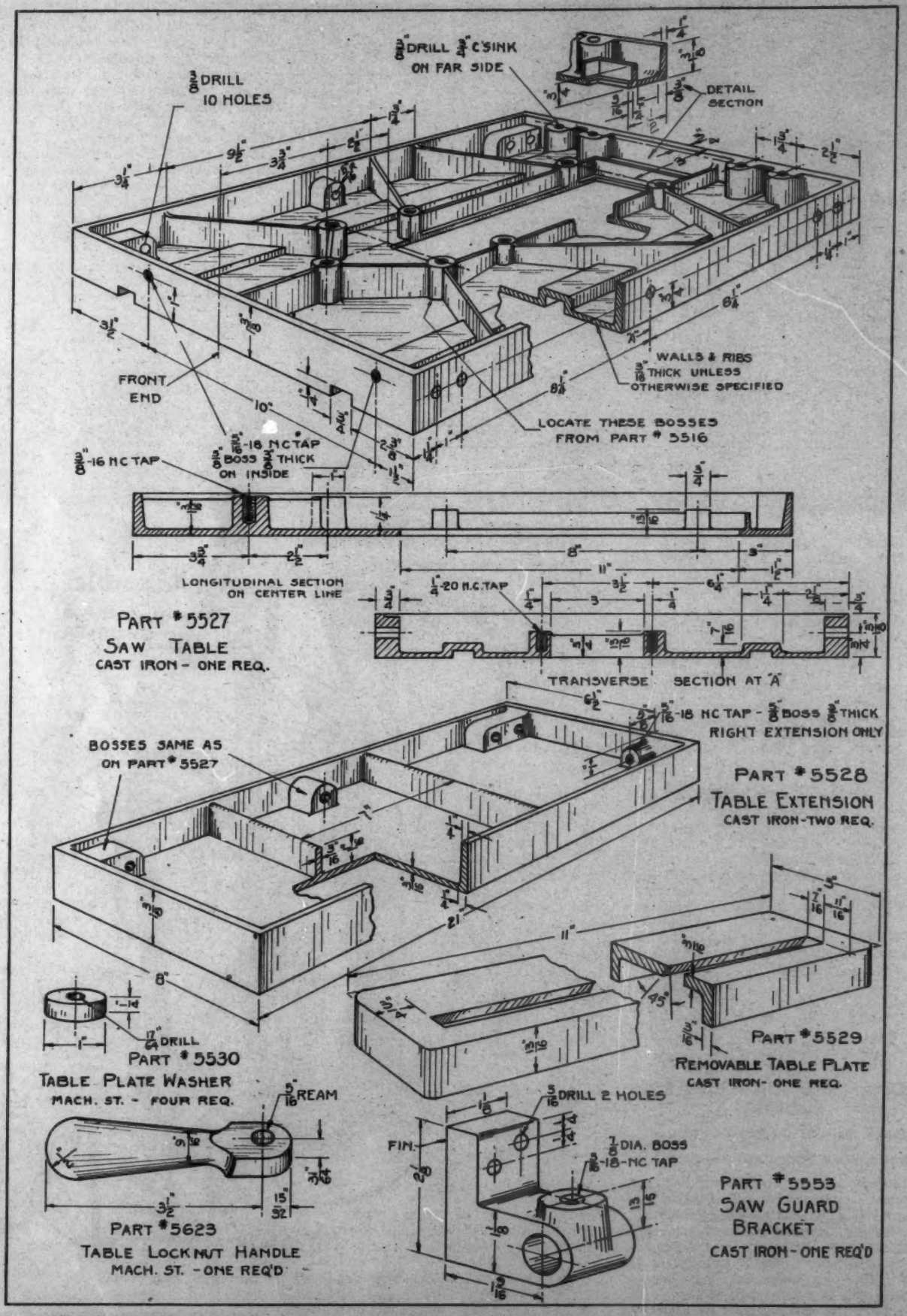
(Continued on page 43)

LIST OF MATERIALS

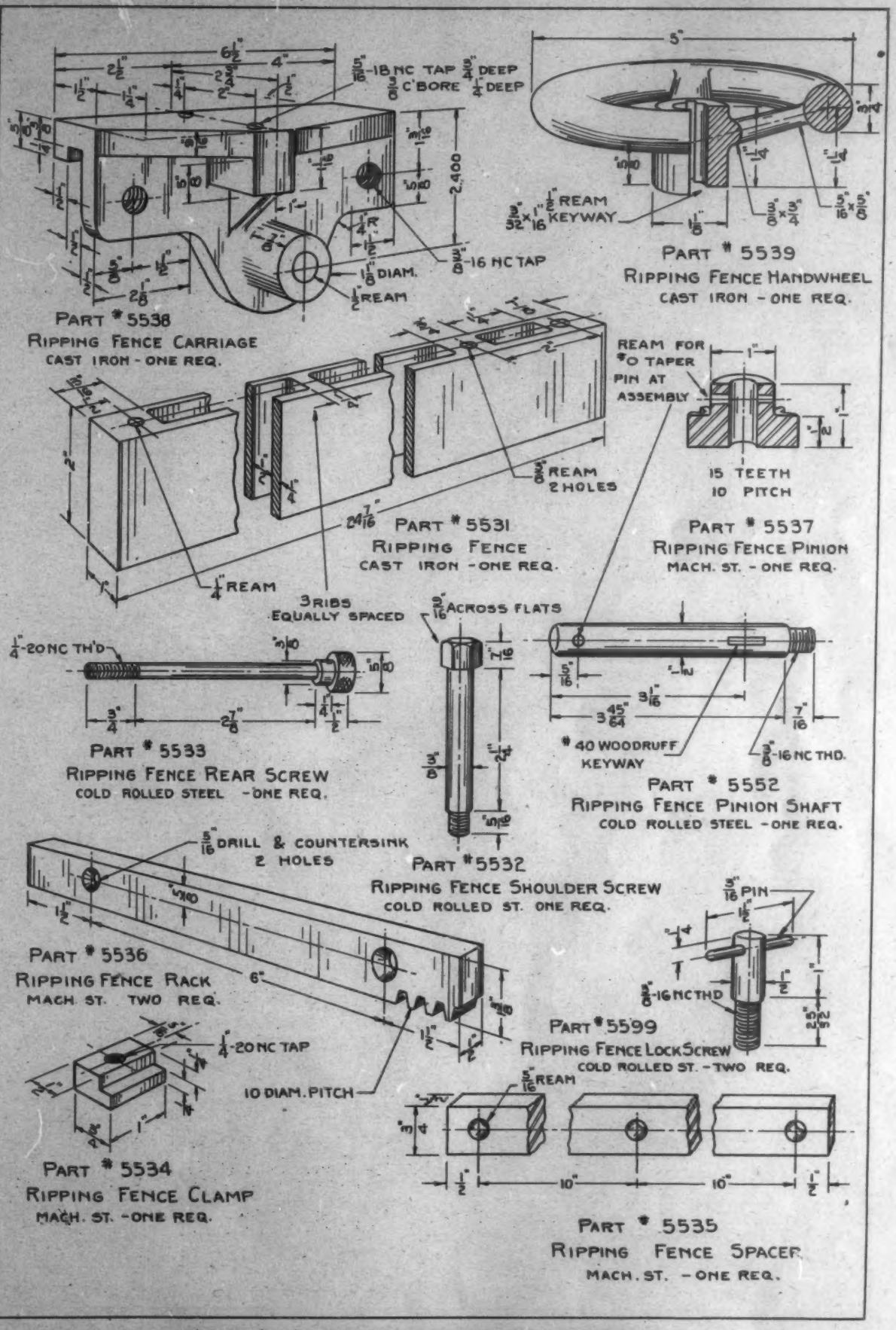
Name	*Size*
Front panel	18 x 10 x ¼-in. ply
Back panel	22 x 10 x ¼-in. ply
Bottom	10 x 6 x ¼-in. ply
¼ Round molding	9 x ½ in.
Awning cloth	46 x 9 in.
Upholstery cord	10 or 11 ft.
Upholsterer's nails	4 doz.
2 Hinges	2 x ½-in. butts
Screws to fit	¼-in. long flathead
Weldwood glue	
Sandpaper	No. 2/0
Stain	
Shellac	



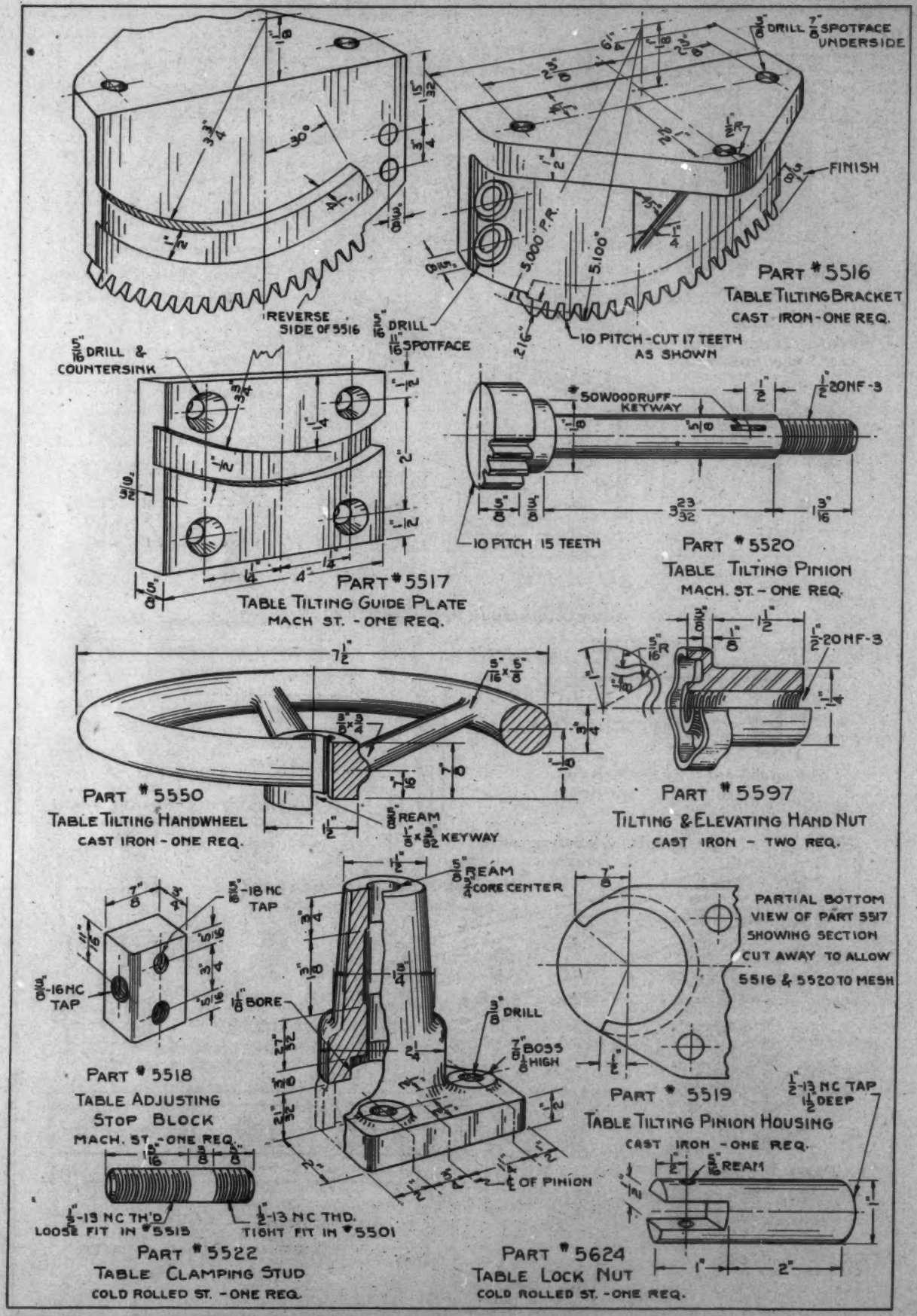
Sling bag designed by Simon S. Palestrant



Sheet 4, details of 10-inch bench saw by William A. DeVette (continued from page 464 of the December, 1945, issue)



Sheet 5, details of 10-inch bench saw by William A. DeVette

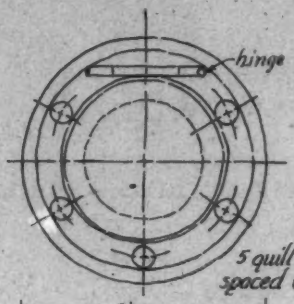


Sheet 6, details of 10-inch bench saw by William A. DeVette

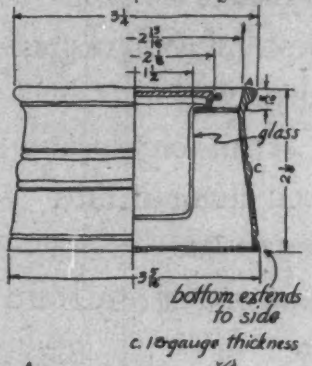
HOW IS A MEASURED DRAWING MADE?

Why? Research is necessary for gaining accuracy of details in historic work. Occasionally an early piece of furniture or other item must be duplicated.

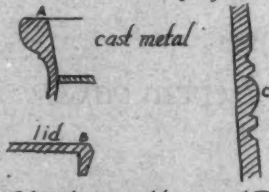
Pewter Inkwell



Where are such pieces found? In private collections, museums, and shops of dealers.

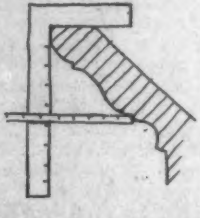


How prepare for the drawing? 1. Get permission and have a clear understanding of what may be done. 2. Set a date. 3. Arrange equipment, including rule, tape, square, pencils, ½ inch squared paper, tracing paper, small plumb bob, calipers, dividers, modeling wax.



Sketch for a Measured Drawing

What procedure? 1. Make a free-hand orthographic sketch on co-ordinate paper, approximating dimensions or proportions. 2. Put dimension lines on drawing where measurements are to be made. 3. Measure object and write dimensions on drawing. 4. Make full-size sketches of details. Letter these and key to master drawing. 5. Take wax impression of details not easily or accurately drawn. Plaster casts may be made later. 6. Make notes, freely, of color, material, finish, construction, maker, owner, date of making, reconstruction, if any. 7. Work up into finished drawing before sketches are "cold". 8. Supplement sketches with photographs, preferably professionally made. 9. Hope you have everything.



If work is published use "courtesy line" indicating ownership.

Plate 68. Design course by Burl N. Osburn, director of industrial arts, State Teachers College, Millersville, Pa.

HOW IS A "MORGUE" FORMED?

A morgue is a collection of source materials assembled for its power of stimulating ideas. It consists of photographs, sketches, clippings, catalogs, samples and indexes.

Forms:

Notes and sketches. Notebooks, separate sheets or cards kept in a file or in envelopes

Measured drawings. Filed in portfolios or folders

Clippings. Filed in scrapbooks, pasted in loose-leaf notebooks, pasted to index cards, or sorted into marked envelopes

Magazine articles. Kept in large envelopes, expansion folders, mounted in scrapbooks, or attached to special gummed tabs fastened in the back of standard folders of cap size.

Photographs. Mounted in albums, or pasted on stiff cardboard for use in a projector of the reflecting type

Magazine illustrations. Same as for photographs

Samples of materials, catalogs, and bulletins. Kept in boxes and library pamphlet boxes or filing cases

Sources:

Clippings and articles. Used magazines, from private homes, or used magazine stores found in most cities (*Not from libraries*), magazine sections of the better Sunday newspapers, and special feature sections of dailies

Photographs. Besides those obtained from private sources, great help may be had from museums, some of which have inexpensive prints in one or two sizes of every item they own.

Catalogs. Trade magazines, household-type magazines, Wilson Index

Caution: Make excessive provision for expansion before starting to collect

Plate 69. Continuation of design course by Burl N. Osburn, director of industrial arts, State Teachers College, Millersville, Pa.

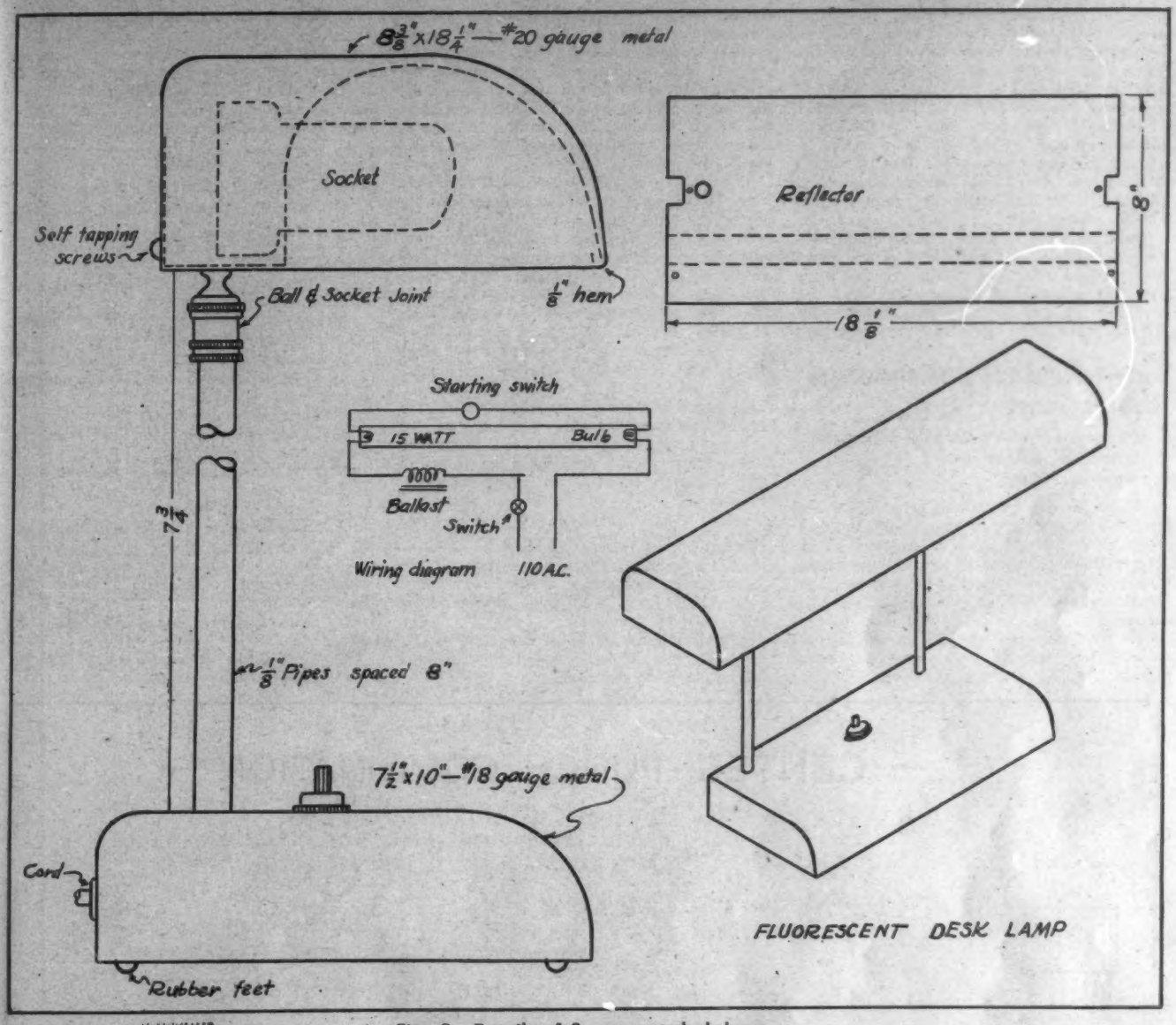


Fig. 2. Details of fluorescent desk lamp

(Continued from page 37)

the panel. Be sure that the length coincides with the perimeter of the panel and leaves one 10-in. end exposed as the top of the bag. Use the short upholstery nails to anchor the cloth in place as well as to decorate it.

Set the back panel in proper position so that the hinged bottom faces the molding and rests on it, when the bottom is opened in position. Draw the cloth tightly around the back panel, similarly to the way it was done on the front, so that the bottom panel cannot possibly slip down past the molding ledge. Glue and nail it in its position along the back panel.

Now thread the ½-in. upholstery cord through as shown. It should extend under the bottom of the bag and be knotted between the two top holes of the front panel. Adjust the length to suit wearer's height and convenience.

On the inside surface of the back panel, centered and about 1½-in. below the top end, screw a snap clip as shown. This will conveniently hold shopping memos, gloves, or even act as a hook for mom's handbag.

FLUORESCENT DESK LAMP

IRA H. JOHNSON
Minneapolis, Minn.

The desk lamp shown in Figure 1 possesses great student interest, involves a considerable number of varied metalworking operations, can readily compete with similar commercial products, and is well liked by industrial-arts instructors of metalworking. The details are shown in Figure 2.

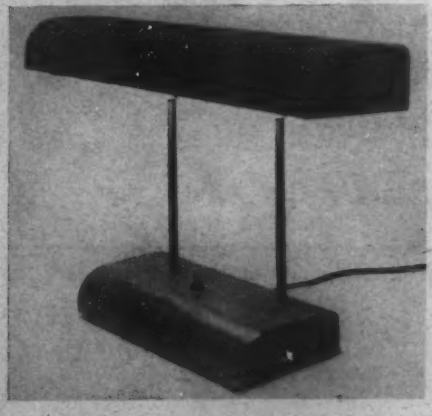


Fig. 1. Fluorescent desk lamp

Reflector: The forming rolls are used as an aid to give the reflector a parabolic shape so it will reflect a maximum amount of light. It is constructed of 20-gauge sheet iron and on it are mounted the sockets, ballast unit, and ball-and-socket joints.

Shade: This is made of 20-gauge sheet iron. It is formed so as to accurately fit the end pieces which are made of the same material. The gradual front bend is made on the forming rolls and the more abrupt bend at the back by bending around a ½-in. diameter rod. A single hem on the front edge serves as a holder for the front edge of the reflector and the back is fastened to the rear reflector edge with three self-tapping screws. The shade and its ends are corner welded and the joint is finished by filing and buffing.

Base: The construction is similar to the shade with the exception that there is no hem

along the front edge and 18-gauge sheet iron is used. Small pieces of metal brazed into the corners are used to mount the rubber headed tacks that are used for feet. The base also may be fitted with a base made of wood.

Tubular supports: The supports are made of pieces of ⅛-in. pipe. These are brazed to the base on one end and they are threaded to fit the ball-and-socket joints on the other. Brazing is necessary since welding would warp the base. The ball-and-socket joints, while not necessary, make it possible to have an adjustable shade and are readily obtainable at most variety or dime stores. These pipes also provide a method of running the wires from the reflector to the base.

Finish: A commercially available durable wrinkle finish obtainable in a variety of colors.

CENTER-PUNCH COMBINATION

JOHN G. MILLER

Department of Vocational Education
School of Education
New York City

Many times, when making a layout on metal, it is necessary to obtain from the toolroom three tools: a hammer, a center punch, and a scriber. A compact tool, combining these three essential layout tools in one unit, has been designed as a project in the machine-shop unit of our general metal shop.

Not only is this project a popular one among the students because of its unique design, but its teaching value is recognized by the teacher who wishes to include in one project a good number of fundamental lathe operations. Work is held in the universal chuck, spring collet, and between centers during the machining of the various parts. Facing, straight turning, shouldering (right and left hand), chamfering, taper turning by offsetting the tailstock and also by the use of the compound rest, necking, turning a spherical radius, threading, and knurling are among the important operations taught by the making of this project.

The making of the *center-punch combination* also offers the student experience in drilling in the lathe, tapping and threading with machine screw and fractional size taps and dies, and drilling and reaming for a standard taper pin. As the parts are made from tool steel as well as machine steel, the student obtains experience in machining both of these types of steel. Since the tool steel parts are required to be hardened and tempered, heat treatment of steel is also taught.

This tool was designed as a layout tool. The hammer is designed for use with the center punch and should not be used for heavier work. The scratch awl should be screwed firmly into the center punch before the punch is used with the hammer.

Procedure:

Head

Material: 1 by 3¼-in. tool steel

1. Cut a piece of stock the required size in the power hack saw.
2. Center drill both ends and mount in lathe between centers.
3. Turn down to ¾-in. diameter.
4. Reverse in lathe and turn remainder of heat to ¾-in. diameter.
5. Lay out center line, under cuts, and end faces as shown in Figure 2.
6. Undercut portions shown in Figure 2.
7. Place work in a universal chuck, face end to layout line, and round corners slightly.
8. Reverse in chuck, face to length, and round corners on second face.
9. Remove from lathe and center punch for 5/16-in. hole.
10. Set up in drill press so that axis of hole for handle is at right angles to axis of the head. Drill 19/64 in., and ream 5/16-in. hole for handle.
11. Polish with abrasive cloth in lathe.

Handle

Material: ⅜ by 7½-in. cold rolled steel

1. Cut stock to required length and center drill both ends.
2. Mount in lathe between centers and face one end.
3. Turn down stock to ½-in. diameter for a distance of more than 4 in.
4. Lay out knurled portion of handle, using hermaphrodite calipers.
5. Lay off total length from faced end.
6. Reverse in lathe and face second end to length.
7. Turn .313-in. diameter, ⅝-in. long.
8. Figure offset for taper and offset tailstock proper amount.
9. Turn tapered portion to required diameter.
10. Turn 45-deg. bevel.
11. Reverse again in lathe and knurl handle with medium knurl.
12. Place in a universal chuck, protecting knurl with copper, and drill 17/64-in. hole 2¾-in. deep.
13. Drill 5/16-in. hole ⅝ in. deep for thread.
14. Tap ⅜ -16 thread in end of handle.
15. Polish handle except for small end.

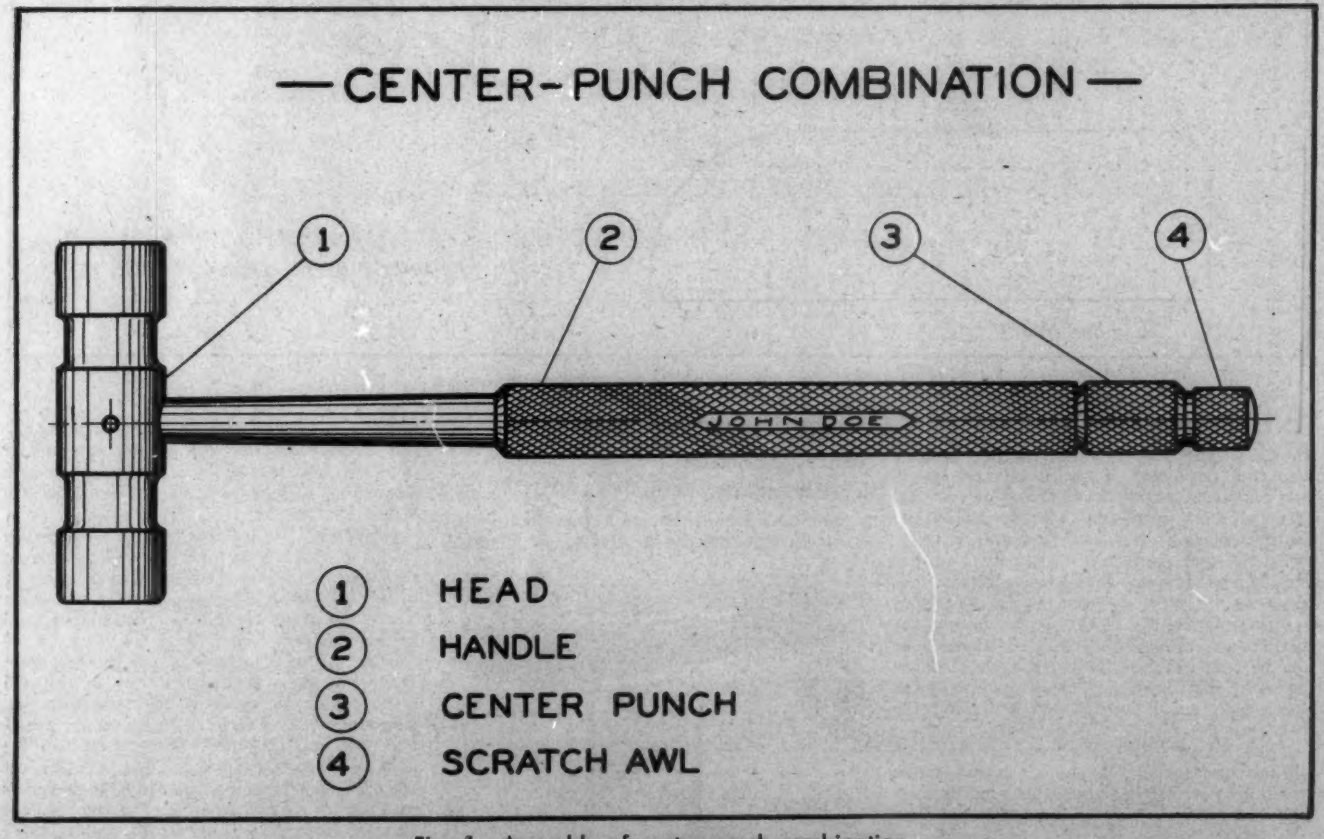


Fig. 1. Assembly of center-punch combination

Center Punch

Material: ½-in. drill rod

1. Chuck a length of drill rod in spring collet allowing it to extend about 2½ in.
2. Turn 60-deg. point on end using compound rest.

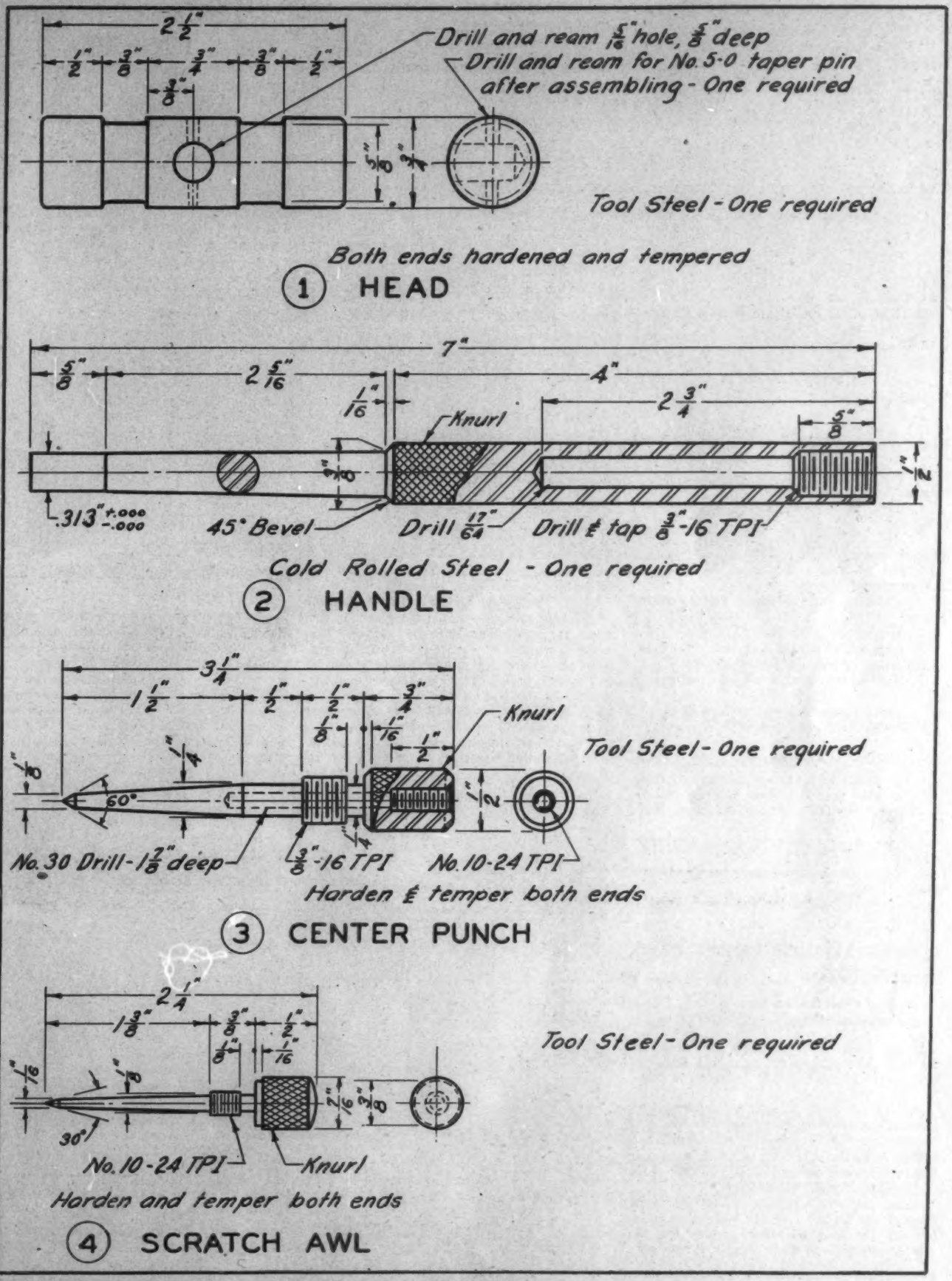


Fig. 2. Details of center-punch combination

3. Lay out shoulder 2 in. from point.
4. Turn ¼-in. diameter to this shoulder
5. Figure angle and turn slim taper, using compound rest.
6. Extend rod about 1½ in. more from collet.
7. Turn ⅛-in. neck to ¼-in. diameter with cutting off tool.
8. Turn ⅜-in. diameter.
9. Set up lathe for cutting threads and cut threads on ⅜-in. portion. Test thread to fit handle.
10. Knurl head of punch.
11. Chamfer one end of knurled portion.
12. Cut to length with cutting off tool.
13. Hold knurled portion in universal chuck and chamfer end.
14. Drill No. 30 hole, 1⅞ in. deep.
15. Drill No. 25 hole for thread.
16. Thread No. 10-24 with tap.
17. Polish with abrasive cloth.
18. Harden and temper.

Scratch Awl

Material: 7/16-in. drill rod

1. Select a piece of drill rod and chuck it in a spring collet extending it about 2 in. from collet.
2. Turn 30-deg. point on the end.
3. Turn down to .190 in. for 1⅝ in. in length.
4. Turn ⅛-in. neck to ⅛-in. diameter, using cutting off tool.
5. Figure angle of taper and turn taper to dimension using compound rest.
6. Extend from collet about ¾ in. more and knurl end.
7. Undercut end of knurl as shown in Figure 2.
8. Thread awl with No. 10-24 die.
9. Lay out length of awl and cut off to length using cutting off tool.
10. Hold in universal chuck and round end with a file.
11. Polish with abrasive cloth.
12. Harden and draw temper.

Assembly

1. Press handle into head on arbor press.
2. Lay out, drill and ream hole for No. 5-0 taper pin so that pin will set flush with head.
3. Place taper pin in head and tap with a brass hammer.
4. Screw punch into handle and awl into punch.
5. Submit to instructor for inspection.

A GENERAL SHOP REPORT CARD

ISRAEL BENSMAN

Central High School
Sheboygan, Wis.

Schools that have five different unit shops in their general-shop program will find the report card illustrated here suitable for adaptation to their use.

At Central High School, the general-shop program comprises a year's work in the fields of drawing, metals, printing, woodwork, and industrial mechanics. Five different groups of boys are rotated through these five unit shops for periods of eight weeks each.

Since the completion of each eight-week shop period did not coincide with the completion of the four ten-week periods for the other academic and shop courses, it was necessary to adopt an additional report card for use by the general-shop students.

CENTRAL HIGH SCHOOL
SHEBOYGAN, WISCONSIN

General Shop Report Card

School Yr., Sept....,19....-June....,19.... H. R.....

Report of..... Class.....

SUBJECT	A	INSTRUCTOR
Gen. Drawing		
Gen. Metals		
Gen. Printing		
Gen. Woodwork		
Industrial Mechanics		

EXPLANATION OF SYMBOLS

E Among the best in class.
G Above average in class.
F Among the middle group in class.
P Below middle group in class.
P- Among the weakest in class.
C Failure.

This report card is used only by students enrolled in General Shop, and used in addition to the regular school report card. This program consists of five eight-week periods in five unit shops, in which the student receives fundamental skills and knowledges. These units are on an exploratory level so that the student can discover his aptitudes and interests in shop courses.

This is to signify that I have read this report.

First Period.....
Parent or Guardian
Second Period.....
Third Period.....
Fourth Period.....
Fifth Period.....

HENRY EARL SMITH, Superintendent
ARTHUR H. MENNES, Principal

At the completion of the eight-week shop period, the instructor places the grade on the report card and gives it to the student. The card is returned to the next instructor who keeps them until the completion of his course, and so on. The card is the property of the student at the end of the year. Entries are made on office class cards, and an average grade is entered on the student's four-year record. The general-shop grades do not appear on the standard report card that is given to all students.

FOLLOW DIRECTIONS WHEN USING DDT

Dichlorodiphenyltrichloroethane!

It's as formidable as its name — this DDT — warns the National Safety Council, unless directions are carefully followed. Sure death to flies, roaches, fleas, and lice, DDT also can make trouble for the user if proper care is not taken to follow directions.

In spite of its inherent toxicity, there will be no danger to the user if these two essential precautions are taken:

1. Avoid inhaling the spray.
2. Avoid skin contacts with the substance, especially if it's mixed in an oily solution.

Take care to spray away from the face, and wear long-sleeved high-necked clothing which will expose as little of the skin as possible.

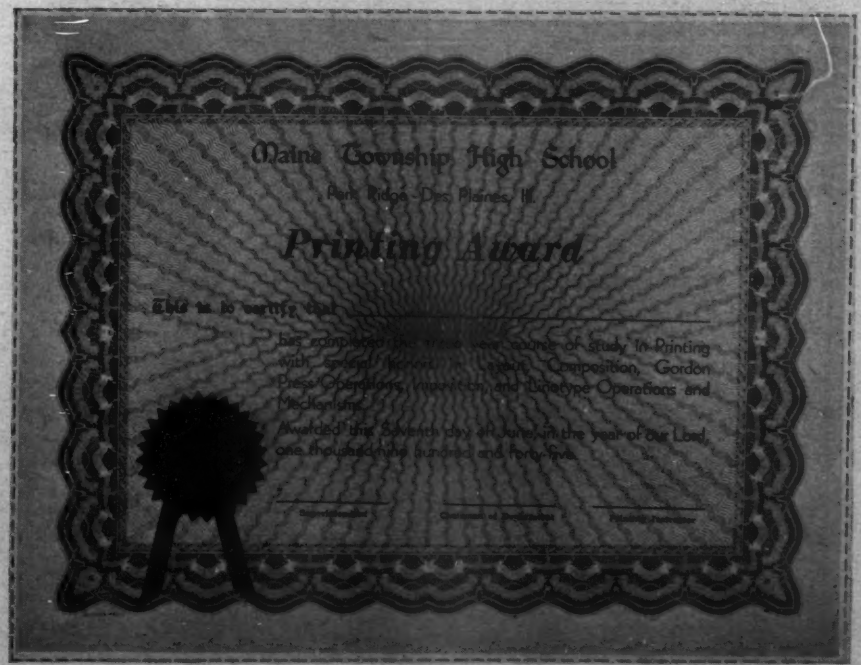
While there is less hazard in the use of the powder form of DDT, the Council adds a note of warning on mistaking the powder for foodstuffs. Keep it in a well-labeled container. — *Safety News*.

A PRINTING AWARD

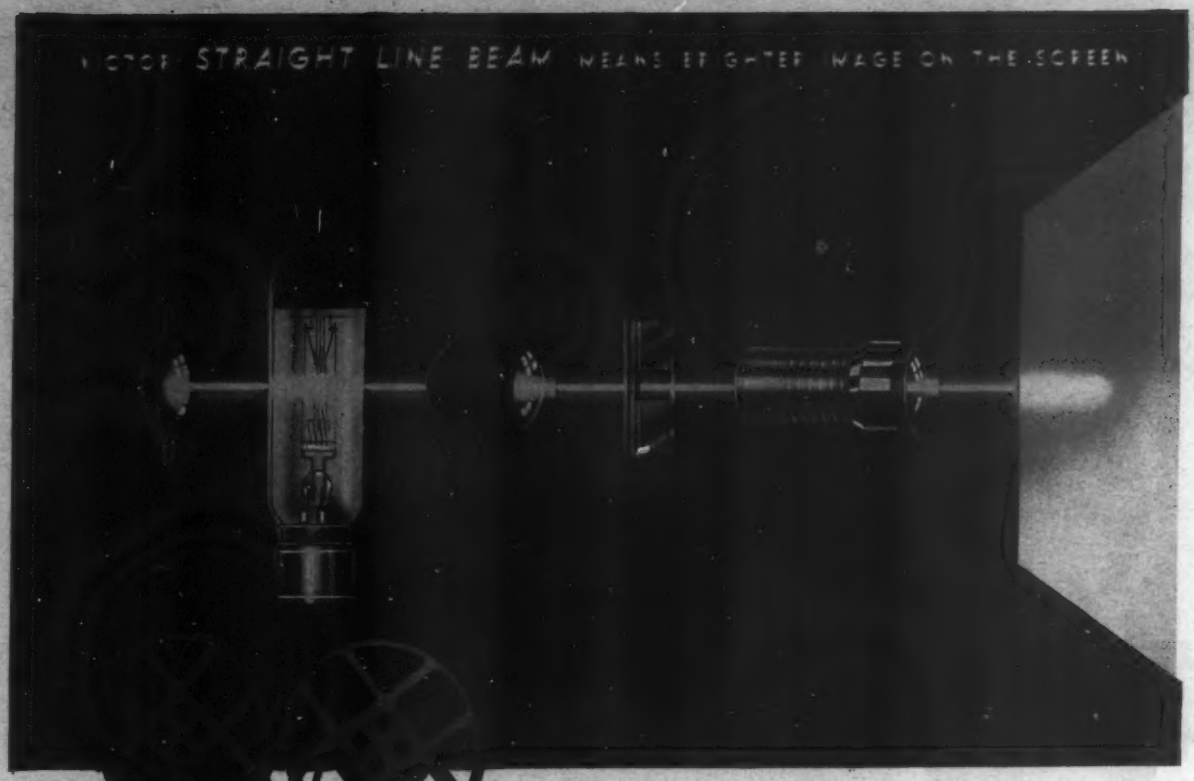
NORMAN CROUCH

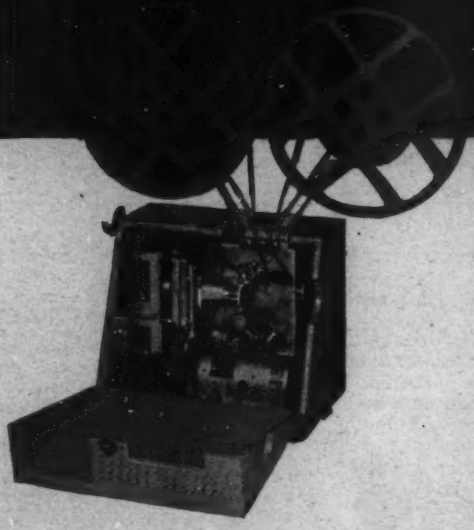
Maine Township High School
Des Plaines, Ill.

The award, pictured herewith, is given to the student in a special awards assembly of the entire student body. It serves a need in a good teaching program in printing, as a remembrance of the industrial-arts course, or, if the school is on a trades and industry program, it will serve as an index to the student's abilities. If it is given to a trades and industry student, the clock hours in each operation are indicated on the back of the diploma.



Printing award submitted by Norman Crouch





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Spira-draft Lamp House means longer lamp life . . . means brighter image for a longer time . . . means fewer lamp replacements. Standard, pre-focused lamps obtainable anywhere, at no extra cost.

Other exclusive features — for brighter illumination — are: Coated Projection Lens, Conza Condenser Lens, Special Shutter Design and Instant Accessibility to entire optical system for cleaning.

Can you afford to use other than the finest 16mm equipment?

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Home Office and Factory: Davenport, Iowa
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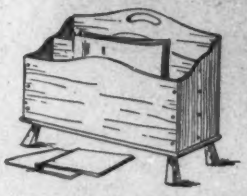
Chicago (1) 188 W. Randolph

MAKERS OF 16MM EQUIPMENT SINCE 1923

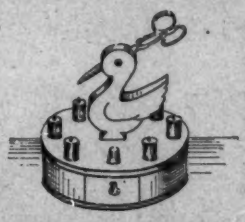
New PROJECT PLAN Sets

Just Out – 5 Practical and Useful Plan Sets Are Added to Stanley's Popular Shop Project Material – Each New Set Includes 5 Different Projects – at Only 10c a Set!



No. 15 – *Small Colonial Furniture:* Bench, Magazine Stands of 3 different types – Book and Cigarette Stand.

No. 16 – *Children's Toys:* Toy Wagon – Kiddie Push Car – Toy Wheelbarrow – Rocking Horse – Scooter.



No. 19 – *Chests, Racks, Rocker:* Dressing Glass – Child's Rocker – Bedside Chest – Unique Sewing Kit – Portable Towel Rack.

No. 17 – *Folding Tables and Trays:* Picnic Case and Table – Folding Snack Table – Combination Tray – Collapsible Bed Tray – Match Box Holder.

No. 18 – *Tables and Stands:* Revolving Book Stand and Table – Folding Card Table – Nest of Plain Tables – Nest of Colonial Tables – Folding Coffee Table.

14 OTHER POPULAR PLAN SETS ARE AVAILABLE

STANLEY

THE TOOL BOX OF THE WORLD

MAIL COUPON TODAY
10c A SET POSTPAID

Stanley Tools, Educational Dept., 1A1145 Elm Street, New Britain, Conn. Enclosed is ($.) – 10c for each set according to numbers checked below – postpaid.

15 ( ) 16 ( ) 17 ( ) 18 ( ) 19 ( )

Name.....

Title.....

School Name.....

City..... *State*.....

EIGHT LESSONS MAY BE TAKEN FROM THE LIFE OF BEN FRANKLIN

In an address given at the annual banquet of the Old Time Printers Association, Chicago, several years ago, the late Douglas C. McMurtrie cited the following as lessons that printers of today could learn from the example set by Benjamin Franklin:

1. *Independence of thinking.* In spite of the fearlessness and freedom of Franklin's thinking, he reached wise and sound conclusions. In the Poor Richard almanacs he gave us many thoughts which have become proverbs for Americans. In his exhortation to "waste not, want not" he gave us a rule to follow in time of shortages due to war necessities.

2. *Hard work.* Franklin's capacity and enthusiasm for hard work set an example which many of us could profitably follow. One of the elements in our defense work is the will of workers to work hard, and accomplish as much as they can, rather than a scant percentage of personal capacity.

3. *Good humor.* Under the most exigent circumstances, Franklin maintained an equable temper and a fine sense of humor. He appreciated the ladies, and enjoyed most of the pleasures which life affords. Diversions probably served to heighten his capacity for intense application to problems in hand.

4. *Inventiveness.* Franklin never assumed that because a thing had not been done, it could not be done. Instead, he forthwith explored the possibilities, and succeeded in making several of the important inventions of the age. Let us be equally resourceful, urged Mr. McMurtrie.

5. *Encouragement of education.* Franklin advanced the proposals that eventuated in the establishment of the University of Pennsylvania, and was also active in founding the first library supplying books to his fellow citizens of Philadelphia. Having worked out his own salvation, educationally speaking, he was zealous to help other young men to tread an easier path to self-improvement.

6. *Statesmanship.* As an overseas representative of our Revolutionary government, during highly troublous times, Franklin was wise, quick witted, and tactful, and gained much for the causes he advocated.

7. *Free enterprise.* Benjamin Franklin believed in and profited by the American system of free enterprise. By industry in the operation of his own printing office, he earned a competence, and then financed, as a silent partner, the establishment of a printing office in South Carolina, and of another on the island of Antigua, the name of which has recently been recalled to us by establishment there of a U. S. base.

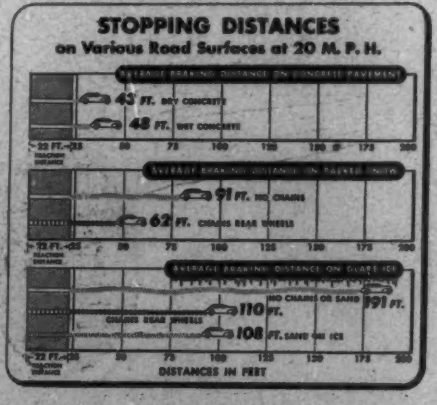
8. *A good printer.* Franklin was indeed a good printer. He always spoke and wrote disparingly of sloppy and uncraftsmanlike work. He won and held customers by careful typesetting and presswork. "Would that we could have more such work today!" reflected Mr. McMurtrie.

"Yet in view of his many accomplishments and abilities as philosopher, scientist, and statesman," concluded Mr. McMurtrie, "this great man preferred to designate himself, in his own last will and testament, as 'Benjamin Franklin, Printer. . . .'"—*News Bulletin*, National Graphic Arts Education Association.

WINTER DRIVING FACTS

Safety authorities are concerned about winter accidents this year because of the increased number of cars and drivers that are now on our highways. The following charts show National Safety Council research facts.

A car travels 22-foot "Reaction Distance" while driver reacts and applies brakes after seeing reason to stop. Major winter hazards are skidding and reduced visibility. Are your brakes, tire chains, windshield wiper, defroster, and lights in good condition for winter driving? Neglect of any one may mean sliding to the junk pile or hospital!



Did you know wet ice at near thawing temperature is twice as slippery as ice at zero temperatures? The following chart shows braking distances on ice at varying temperatures with and without antiskid chains. Facts

(Continued on page 22A)

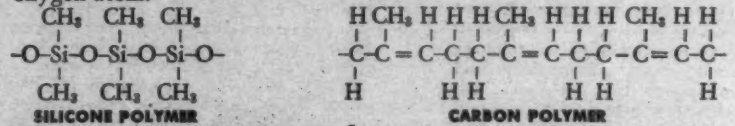
GE Science Shorts

ON SUBJECTS YOUR STUDENTS WILL ASK YOU ABOUT

SILICONE RUBBER

SILICONE RUBBER, new product of the G.E. Research Laboratory, retains its elastic properties at temperatures from minus 60 to 575 degrees F. A silicone rubber gasket, after operating continuously at 300 degrees F. for 300 hours in a turbosupercharger, like the one on the right, is still so soft that it can be used again. Turbosuperchargers get hot in the corrosive blast of the engine's exhaust, and operate in the bitter cold substratosphere. That's why the gasket must be made to withstand heat and cold. The use of rubber is limited because at low temperatures it is brittle and smashes like glass, while at high temperatures it melts or burns. But the new silicone rubber will take violent jolts and even though it may get very hot, or cold, will not lose its elasticity.

SILICON-OXYGEN BACKBONE. Closely related to carbon, silicon is present in sand and glass, which are highly resistant to heat. Both elements can form long chain-like molecules called polymers. Organic polymers, such as natural and synthetic rubber, have as a backbone a string of carbon atoms. Silicone is also a polymer, but its backbone is a series of units each consisting of a silicon and oxygen atom.



SILICONE POLYMER — CARBON POLYMER

This replacement of the carbon backbone with silicon-oxygen linkages is responsible in most instances for improved thermal stability.

RESEARCH IN SILICONE rubber continues. Before the war, work was already being done in this field. War needs hastened the commercial development of silicones. They take the forms of a plastic as soft as putty which will bounce as high as rubber; an electrical insulating compound that will operate continously without charring at high temperatures; oils with almost unchanging viscosity which remain liquid and non-volatile as temperature changes; and vapors which make fabrics and ceramics water-repellent.

In its present state of development, silicone rubber is not suitable for uses that require high tensile strength. In this respect, its growing pains are not unlike those of synthetic organic rubber. But the research in silicone rubber is by no means over. "Silicone chemistry," so parallel to "carbon chemistry," has possibilities which stagger the imagination.

●

This advertisement is one of a series, designed as a service to teachers of question-asking boys and girls. *General Electric Co., Schenectady, New York.*

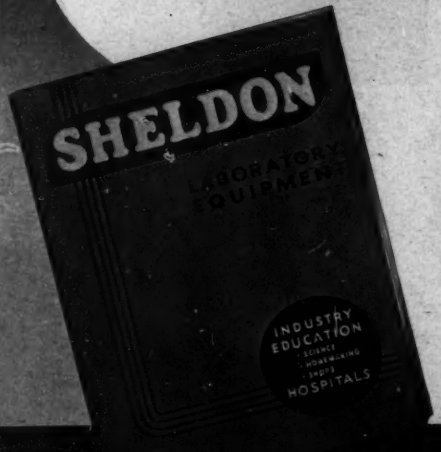
GENERAL ELECTRIC

966-60C-211

Sheldon

VOCATIONAL EQUIPMENT

General Shop and Vocational Electrical Bench



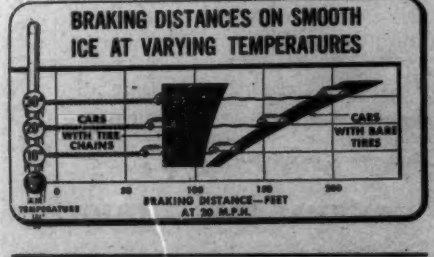
SHELDON'S long, continuous, and successful experience; efficient planning service, and unsurpassed production facilities combine to provide the utmost in utility and economy in shop equipment. Let SHELDON'S Planning Department assist in preparing shop layouts, compiling budgets, and writing specifications.

SHELDON'S new catalog of equipment for Industrial Arts and Vocational Education is now on the press. Reserve your copy today.

E. H. SHELDON & COMPANY
MUSKEGON, MICHIGAN

(Continued from page 20A)

are based on thousands of tests on Lake Cadillac, Mich., and at Iowa State College.



Personal News

FORMER TEACHER NAMED SUPERINTENDENT

J. Everett Light of New Hartford, Conn., has returned to Rushville, Ind., to assume the superintendency of the Rushville City Schools. Mr. Light taught in the Rushville Schools from 1935 to 1941. He is a graduate of Manual Training High School of Indianapolis and of Ball State Teachers College. He has taken considerable graduate work at Columbia and Indiana Universities. While in Connecticut, Mr. Light was for two years assistant professor of vocational-industrial education at the Teachers College in New Britain, and for the past two years has been the director of the Connecticut Veterans' Employment and Advisory Committee.

GUY WULFING RETIRES

After 38 years of service in the Gary, Ind., Schools, Guy Wulfing, formerly director of vocational education retires at the age of 74.

Mr. Wulfing was a pioneer in the field of industrial education. He was Gary's first shop teacher. He later organized apprenticeship classes and other vocational work. He advocated a broad field of exploration for grade children.

With Mrs. Wulfing he is now retiring to a farm near Stroudsburg, Pa.

INDUSTRIAL EDUCATOR PASSES

M. W. Heckmann, for the past many years head of the industrial-arts department of the State Normal and Industrial School at Ellendale, N. Dak., has recently passed away.

During his long teaching career Mr. Heckmann served as the head of the industrial-arts departments of three colleges. This is a distinction held by a very few. He served also at Northern Normal at Aberdeen, S. Dak., and at Western Washington College at Bellingham, Wash.

Many Indiana men will remember Mr. Heckmann from the summer sessions in which he taught at Ball Teachers College, Munice, Ind.

♦ Harry Gunderson, who taught formerly at Richmond, Ind., has been made instructor of the general shop, Bloomington, Ind.

♦ Elmer L. Smith has been appointed principal and teacher of industrial arts at Bristol, Ind.

♦ Wesley Felmdee, Claud Rieth, and Paul Welter have been employed to teach electricity, printing, and general shop respectively, at Elkhart, Ind.

♦ Tom V. Altenderfer, printing instructor at the Washington High School, East Chicago, Ind., has been appointed vice-principal of that school.

♦ Russell Steiner has been appointed principal and industrial-arts teacher of the Leo High School, Allen County, Fort Wayne, Ind.

♦ Harry Barrick has been assigned to the industrial education department of Washington High School, Indianapolis, Ind. Prior to his appointment to this position he was an instructor of industrial arts at Bloomington, Ind.

♦ Richard Brollier, formerly teacher at Mishawaka, Ind., has been engaged at Jasper, Ind., to build up a program of industrial arts and vocational education.

♦ W. H. Wooden has been appointed instructor of industrial arts at the Central High School, Laporte, Ind.

♦ LeRoy Leifer, a former instructor in the Navy Electrical School at Purdue, has been put in charge of the electrical shop at Mishawaka, Ind.

Mr. Leifer is a graduate of Marquette University, Milwaukee.

♦ J. C. Spence, formerly of the Studebaker Corporation, is teaching industrial arts at the Main Junior High School, Mishawaka, Ind.

♦ Donald Reel, a former industrial-arts teacher and now principal, has added industrial-arts teaching to his many duties as principal at Montezuma, Ind.

♦ Charles Genet has recently assumed his duties as instructor in the general shop at the New Albany Junior High School, New Albany, Ind. Mr. Genet was graduated from Ball State Teachers College in 1941.

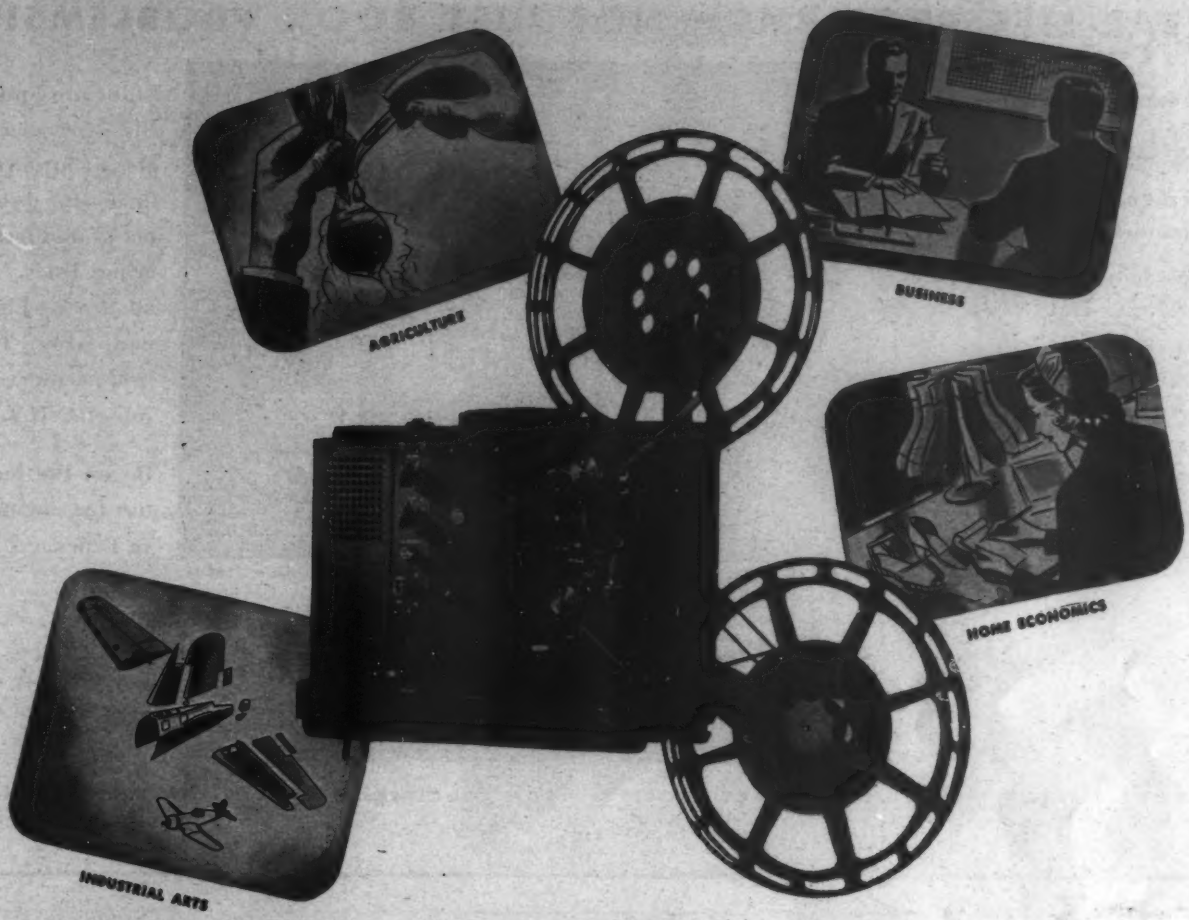
♦ J. J. Thomas of Montezuma, Ind., will assume his new duties as industrial-arts teacher at Rockville, Ind.

♦ George Weber, vocational director of South Bend, Ind., has been on the sick list since midsummer. He is now able to spend a part of each day at his office. All of his many friends are hoping for his speedy recovery.

♦ Joy O. Talley, supervisor of vocational rehabilitation, State Department of Education, Jefferson City, Mo., was accidentally shot in a hunting accident, Thursday, November 1. He was moved to St. Luke's Hospital, Kansas City.

♦ George W. Huber, Wright Aeronautical Training Supervisor of Cincinnati, has been appointed co-ordinator at Tilghman Trade School, Paducah, Ky.

(Continued on page 24A)



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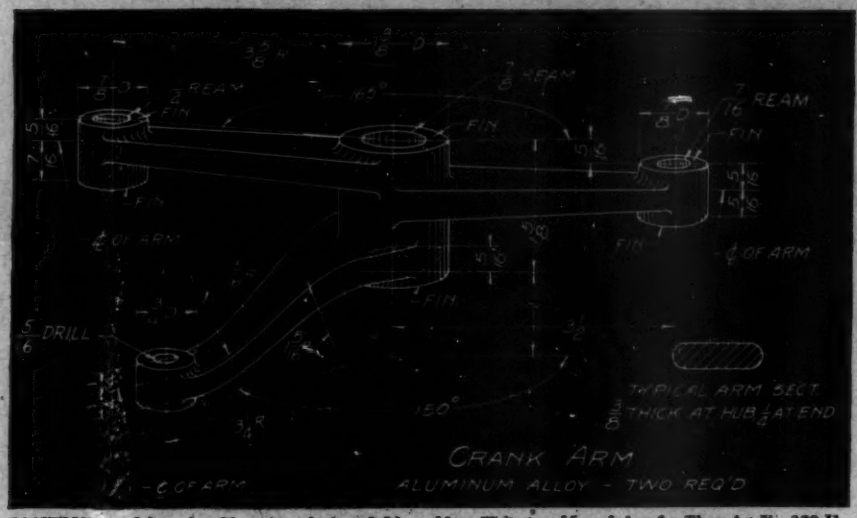

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(Continued from page 22A)

♦ MARTELLE L. CUSHMAN, teacher of ground crews at the Army Air Base, Willow Run, Mich., has been appointed professor of rural education, department of vocational education, Iowa State College.

♦ DR. J. H. FURRAY, formerly senior specialist, U. S. Office of Education, has been appointed director of the air-age education service center which Transcontinental and Western Air, Inc., has established to aid schools in organizing and conducting programs and courses for students.

♦ THOMAS F. GOOGERTY, well-known craftsman in decorative wrought iron work, died recently at St. James Hospital, Pontiac, Mich.

Mr. Googerty was born in Pontiac, Ill., November 14, 1864. He taught forge work at the Illinois State Reformatory for many years. He also taught forge work for seven years in the summer school of The Stout Institute, Menomonie, Wis.

Mr. Googerty was the author of several books on wrought iron work, and also contributed many magazine articles on this subject.

He was a member of the Boston Society of Craftsmen and held the grade of master craftsman in this organization.

♦ SGT. RICHARD HAMILTON, former student of The Stout Institute, Menomonie, Wis., was seriously injured in a truck accident recently in Germany. He is in a Munich hospital at present.

♦ O. C. HOLT and P. W. PROCTOR have been appointed assistant state supervisors of agricultural education for Illinois.

♦ D. M. BURKHISER, formerly industrial-arts teacher in the Dubuque, Iowa, public schools, is now chairman of the division of fine and practical arts at the Nebraska State Teachers College, Chadron, Neb. He accepted this position in the summer of 1945. While in Dubuque Mr. Burkhiser served as president of Iowa Industrial-Arts Association 1944-45. Before going to Dubuque he taught industrial arts at the Storm Lake, Iowa, High School.

♦ FRED W. SWAN, former printing teacher in Canton, Ohio, is now the editor of the Illinois Vocational Progress, issued by the Illinois Board for Vocational Education in co-operation with the Illinois Vocational Association. He is connected with the Illinois Board for Vocational Education, with headquarters at Springfield, Ill.

♦ CARLYLE H. SMITH, formerly of the Providence, R. I., Manual Arts Department, has accepted a position in the Industrial-Arts Department of the Princeton, N. J., public schools.

Mr. Smith was connected with the Providence Schools from 1933 until 1943 at which time he accepted a position as training director at the Lensdale plant of the American Optical Co., in Southbridge, Mass.

♦ MARTIN J. CORCORAN, director of vocational education in Elizabeth, N. J., retired on July 1, 1945.

♦ SAMUEL J. MARTIN has been appointed director of vocational education, Elizabeth, N. J.

♦ ROBERT P. TAYLOR, formerly teacher of machine design in the Thomas A. Edison Vocational and Technical High School at Elizabeth, N. J., has been appointed apprentice co-ordinator of that city.

♦ O. C. HELM, formerly instructor of industrial arts at Berkley Junior High School, Berkley, W. Va., died after a short illness on July 10, 1945.

♦ HENDLEY BLACKMAN, manager of editorial service of the Westinghouse Electric Corporation, has resigned to become Electrical Editor of Product Engineering, published by the McGraw-Hill Publishing Company.

♦ H. C. MCDANIEL has been appointed supervisor of editorial service of the Westinghouse Electrical Corporation, pending the return of Lt. Carl Nagle now with the U. S. Navy.

♦ J. GOULD SPOFFORD, trade and industrial teacher trainer, New Jersey Department of Public Instruction, retired on June 1, 1945, after 26 years of service.

♦ JOSEPH M. FAIR, formerly supervisor of trades and industries, New Jersey Department of Public Instruction, has been appointed teacher trainer, to fill the vacancy created by the resignation of J. Gould Spofford.

♦ STANLEY PERKINS has been appointed supervisor of trades and industries for the New Jersey Department of Public Instruction.

♦ FRANKLIN CONNOLLY has been appointed supervisor of vocational information and guidance in the vocational division of the New Jersey Department of Public Instruction.

♦ ROBERT STEPHENS has been appointed to develop a co-ordinated industrial arts and vocational T & I program at Vincennes, Ind.

♦ TED GREEN, a recent graduate of Indiana State Teachers College, has been appointed industrial-arts teacher at West Terre Haute, Ind.

♦ NORMAN MOSER, a Purdue graduate, is teaching industrial arts and coaching at the Woodburn School, Woodburn, Ind.

♦ KARL K. NELSON, Newton, Kans., who taught industrial arts at Newton for 23 years, and was director of the evening school for 16 years, passed away early in August, 1945.

♦ E. L. MEADER, formerly supervisor of supplementary training in the war-production training program in Wichita, Kans., is now assistant director and co-ordinator of industrial, adult and veteran education in that city. He will work with J. C. Woodin, director of industrial and adult education.

♦ ADRIAN L. POTTER, executive secretary of the American Society of Tool Engineers, with headquarters in Detroit, has been appointed staff head of the New England division of National Patent Council. This new organization of smaller manufacturers is set up to defend the Patent System and develop a better understanding and appreciation of patents, invention, and research.

A grassroots program on behalf of the Patent System emanating from local manufacturers, inventors, and research men throughout New England will be directed by Mr. Potter, according to Mr. Anderson. His address will be National Patent Council, Boston, Mass.

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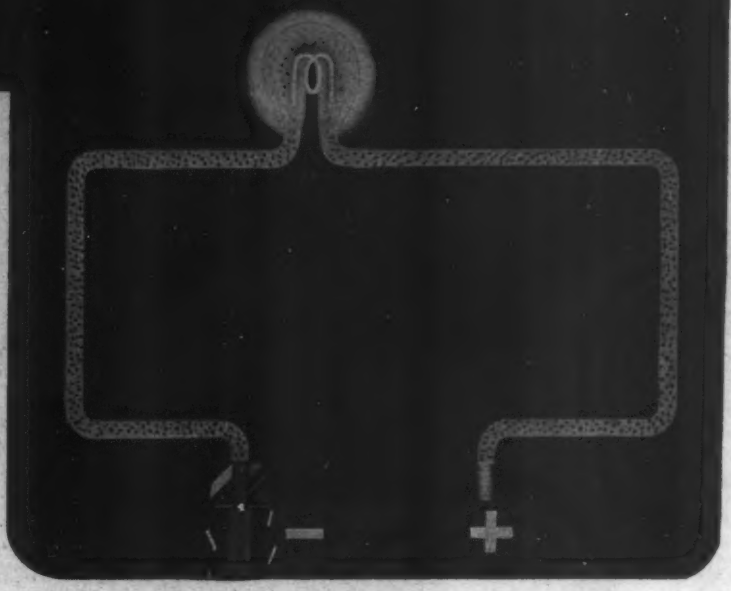

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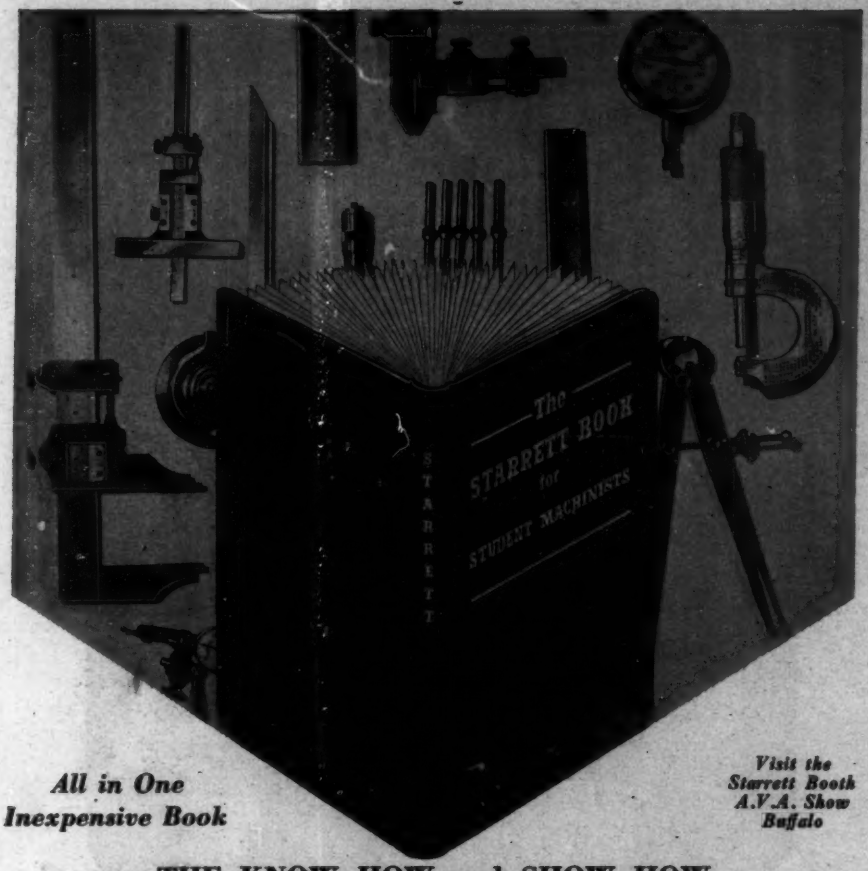

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Association News

♦ About eighty members were present at the last Mu Sigma Pi fraternity initiation. Twelve new members were admitted to the fraternity. At the banquet which followed, Dr. David D. Henry, president of Wayne University, was presented with an honorary membership by President Shields.

Mr. James P. Walsh, the AAA Old Traveler, thrilled the audience with his unforgettable humor and human interest stories of "This Amazing America."

Bill Stirton was the toastmaster.

The new members are: John Amiss, Harlan Arthur, Albert Doty, Dr. David D. Henry, Chester Loomis, George Merdutt, Norman Reckling, Robert Sweringen, Melvin Taylor, Herbert Wright, and John White.

♦ The Vocational Education Department of the Indiana State Teachers Association, met at 9:30 a.m., at the Technical High School, Indianapolis, October 25.

Mr. J. R. Rees, president, Columbus, Ind., presided.

Mr. H. G. McComb, state director of trade and industrial education, spoke briefly on the topic, "Legislation Effecting Vocational Education."

Mr. M. D. Mobley, president, American Vocational Association, addressed the group on the subject, "Vocational Education and Full Employment."

A luncheon meeting provided by the Indiana Vocational Association was held in the school cafeteria, at which time Dr. H. H. London, department of industrial education, University of Missouri, spoke on the subject, "The Practical Arts and Vocational Education in Years Ahead."

The afternoon program included departmental meetings in industrial arts, home economics, and agricultural education.

♦ The Illinois Vocational Association will hold its annual convention on April 4, 5, and 6, at Chicago, Ill.

♦ A district institute program arranged through the co-operative efforts of the Milwaukee County Schools, the Suburban Schools, the Milwaukee Public Schools, the Vocational Schools, and the Milwaukee State Teachers College, was held on Friday, November 2, 1945, at Milwaukee, Wis.

H. B. Nash, superintendent of Schools, West Allis, presided at the general session which started at 8:45 a. m.

Lowell P. Goodrich, superintendent of schools, Milwaukee, expressed Milwaukee's welcome to the teachers who had assembled in goodly numbers.

Col. Jim Dan Hill, Field Artillery Training Corps (president of Superior Teachers College on leave), described some of the schools which he had visited in England, Scotland, Wales, and Ireland, and compared them to similar schools in this country. He said that one of the greatest opportunities for American education is to teach English in a better manner.

Dr. Verne C. Fryklund, president, The Stout Institute, Menomonie, Wis., emphasized that postwar education must be for all, that there must be many more courses, and that the teachers of the future must be better prepared and be able to teach more effectively. He pointed out that vocational education is going to assume an increasingly greater place in the offerings of the school, and reminded his hearers that the mechanic in the shop was doing creative work just as well as professional men did.

Dr. Richard Struna, a native of Czechoslovakia, but a naturalized American citizen now, called upon teachers to lead in the way of peace. "We need diplomats and statesmen of the caliber of our generals," he said.

He described Russia as one who knew it. He had been brought to that country as a prisoner in World War I and pictured it as a country that had 75 per cent illiteracy under the czars, but which now has 75 per cent literacy. He expressed the belief that the United States and Russia should come to an understanding, and that above all we must avoid war between these two great countries because it may mean the annihilation of both nations.

The afternoon sessions consisted of sectional meetings, and a number of luncheon meetings also were held.

The vocational education sectional meeting was presided over by Roy R. Van Duzee, director of the West Allis Vocational and Adult Education School. H. E. Barg, of the Milwaukee Vocational School, was co-chairman.

Clarence Greiber, state director of vocational and adult education, chose for his topic "A Flexible Program to Meet Changing Problems." He reviewed the history of vocational education in Wisconsin and pointed out that the unit courses used to train 150,000 warworkers would, now that the war is over, require a great many supplementary courses to help upgrade these workers who had acquired but a small part of what an all-round mechanic must know.

He also touched upon the necessity of curriculum revision for taking care of the returning veterans, and the need for making vocational school available to all in Wisconsin.

Verne C. Fryklund spoke on "Vocational Education in the Postwar Period." He brought out the need for developing short cuts in teaching the things the soldier had to know. Nothing that was not absolutely necessary could be kept in the curriculum, because the time element was too short.

Now it is necesary to again expand the curriculum to take in a much wider range of subject matter. He especially emphasized that while teaching skills to our youth, we must not forget to educate them so that they can speak and write more fluently, and know more about socioeconomic subjects as well as have a good knowledge about mathematics and science.

Vocational teachers must know their own par-

(Continued on page 28A)

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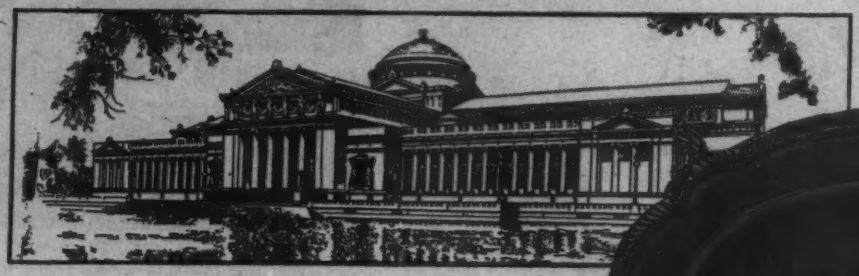

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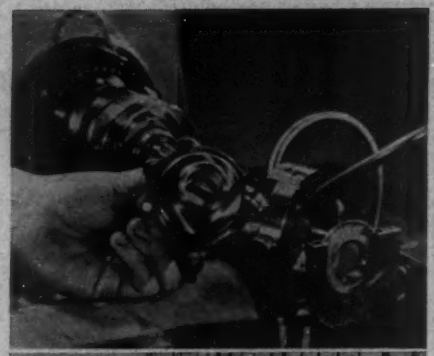

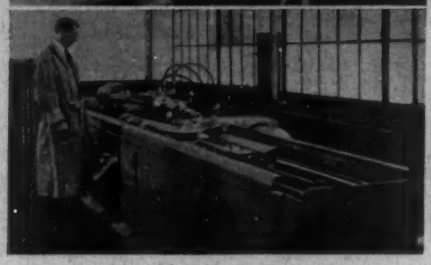

Top: Honing a bearing surface with a ring gauge and automatic sizing control. Bottom: Honing the external surface of a shaft with automatic sizing control

News Notes

♦ An interesting booklet, "Whittling Is Easy With X-acto," has just been issued by the X-acto Crescent Products Co., New York, 1945. It takes the novice through easy stages starting with simple instructions, through a series of 25 graded projects from the very simple to the more difficult.

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The X-acto knife, with its ten blade shapes for different types of cutting and its three handle styles for different weights of work, is ideal for all types of whittling jobs.

This booklet is the fifth in a series which features different art and craft uses of knives. The other books are: "The Boat Whittler's Handbook," "Twelve Technics for the Artist, Student, and Teacher," "The Commercial Artists' Handbook," and "How to Build Solid Scale Model War Planes."

♦ The eighteenth Annual Printing Education Week, which has been scheduled for January 14–19, 1946, should receive special attention this year in honor of Benjamin Franklin's two hundred and fortieth birthday anniversary. He was born January 17, 1706.

♦ Industrial arts conferences, held under the direction of the Industrial Education Division of the Missouri State Department of Education, have been scheduled for Kirksville, Mo., on November 17, and St. Joseph, Mo., on December 8.

♦ A Mining School on the vocational level has been opened at Logan, W. Va. This school offers the pupil training in machine shop, electricity, drafting and blueprinting, welding, ventilating, timbering, trade, and all other phases of the mining industry. Each student is required to spend a certain amount of time in each of the subjects, completing the course in three years. This school acquaints the younger generation with the processes of mechanical mining and

(Continued on page 34A)

(Continued from page 26A)

ticular subjects, but they must also be professionally prepared so that the public may look with confidence on the work done in our vocational schools.

The industrial-arts session was presided over by the cochairmen, Roy Radtke, supervisor of industrial arts, Milwaukee, and William Lathrop, Milwaukee Vocational School.

The topic chosen for this meeting was "Some Problems for School and Industry in the Postwar Period."

Dr. G. A. Parkinson, University of Wisconsin, Arnold Olson, director of personnel, Perfex Mfg. Co., Milwaukee, and James Onarheim, employment manager, Allis-Chalmers Co., Milwaukee, were the discussion leaders.

♦ The Central Association of Science and Mathematics Teachers will hold its convention on November 23 and 24, at the Stevens Hotel, Chicago, Ill. Harold H. Metcalf, River Township High School, Oak Park, Ill., is the secretary.

A FILM ON METAL HONING

LYNE S. METCALFE
New York City

The Jam Handy Organization has produced an 18-min. sound motion picture entitled, "Progressive Honing" (of metal surfaces), which is being shown without charge to selected groups. This film is of special interest to students engaged in metal workshop project study, and others working in: (*a*) manufacturing plants, especially those in the metal trades, (*b*) metal finishing school workshops, (*c*) engineering groups, and clubs, and (*d*) product finishing departments.

Briefly, this educational film illustrates clearly some of the things that have been learned in metal finishing during the war which can be of value to peacetime industry. The picture also presents seven postwar honing machines.

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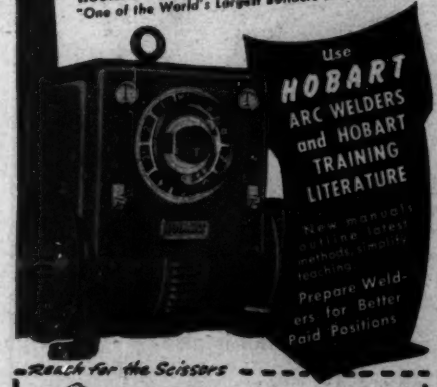
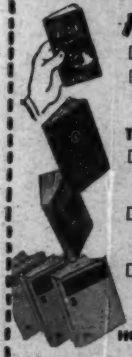


Reach for the Scissors



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HOBART BROS. Co., Box IAV-[illegible]roy, O.

Name
Address
City State

Shop Equipment News

New Products—Publications

DIVERSIFIED STOOLS

Steel stools, available in five heights and 80 models, which have a diversity of industrial and commercial uses, are now being marketed by Lyon Metal Products, Inc., Aurora, Ill., it is announced.

All of these stools have been designed to meet special posture needs. They aid materially in increasing efficiency by reducing fatigue.

The 26-in. stool pictured here, No. 1226, is equipped with an adjustable back, pressed wood seat, and steel feet. The back support may be attached to all models.

For further data on this and other stools, write to Lyon Metal Products, Inc., general offices, Clark Street, Aurora, Ill.

For brief reference use IAVE—110.

A FORECAST

Behr-Manning's vocational-education program, which is now in its tenth year, promises the following educational releases for the school year 1945-46.

1. October, 1945 — Revised metal finishing chart showing sample product swatches and emphasizing "Durabonded" Metalite products.
2. November, 1945 — Informative bulletin on idler backstands.
3. February, 1946 — Information sheets on sanding plastics.
4. March, 1946 — Informative data on production woodworking with wall chart showing actual samples.

These features are offered without cost or obligation to any instructor or supervisor for his shop and classroom use. The primary purpose is to aid the instructor in his presentation of quality coated abrasives as an industrial production tool.

For information write to Behr-Manning Corp., Troy, N. Y.

For brief reference use IAVE—111.

FINE WIRE OF SPECIAL MATERIALS

A new 8-page booklet entitled "Fine Wire of Special Materials" has been announced by North American Philips Co., Inc., 100 East 42nd St., New York.

The text material was written by Robert L. Zahour, technical commercial manager of the company's wire division, and brings the reader up to date on manufacturing methods and problems connected with wires 0.002 to 0.0007-in. diameters and smaller.

Among the subjects treated are: (1) important steps in producing a good diamond die; (2) drawing the wire; (3) methods for checking diameter, elongation, tensile strength, and ohmic resistance; (4) X-ray diffraction examination of atomic structure.

For brief reference use IAVE—112.

CATALOG ON THE AUTOMETRIC BORING MACHINE

A 16-page catalog, CMA 10, on the recently announced Model C Milwaukee Autometric Boring Machine has just been published by the Kearney & Trecker Products Corporation, a subsidiary of the Kearney & Trecker Corporation, Milwaukee 14, Wis.

Excellent illustrations and detailed explanations covering outstanding features, operating data, applications and setups, complete accessories lists and specifications make it a fine informational and working guide book.

Copies of this catalog will be sent on request.

For brief reference use IAVE—113.

16MM. FILM ON SWAGING

An exceedingly interesting and informative motion picture film on the subject of *swaging* is now available to schools.

This 16mm. film with sound commentary has been prepared in English, French, Russian, and Spanish. It portrays the many applications of the swaging process in today's mass production methods.

The movies have been made available without charge by the Standard Machinery Company of Providence, R. I., where this and a short U. S. Office of Education movie on swaging were filmed.

Copies of the film can be reserved for local showings with Maxwell-Roney, 35-36 — 76th St., Jackson Heights, Long Island; The Swind Machinery Co., Philadelphia; Wm. K. Stamets Co., Pittsburgh, and Cleveland, Ohio; Neff Kohlbusch Bissell, Inc., Chicago, Ill.; Smith Booth Usher and Co., Los Angeles, Calif.

For brief reference use IAVE—114.

KNOCK-OUT DRILL CHUCKS

An 8-page pamphlet describing Knock-Out drill chucks, ranging in capacities from 0 to ⅜ in. for keyless drill chucks with Morse and B. & S. taper arbors; and from ½ to 1½ in. straight arbors; has just been issued by the K. O. Lee Co., Aberdeen, S. Dak.

Knock-Out drill chucks are keyless, slip proof, and self centering. They release easily and are built throughout for heavy duty.

For brief reference use IAVE—115.

DIE-LESS DUPLICATING

The Di-Acro system of die-less duplicating is described in a new 40-page booklet containing illustrations and information concerning the latest models of all Di-Acro precision machines.

One of the improvements, that we are just announcing, is the use of Torrington roller bearings in all sizes of Di-Acro benders which increases the capacity and ease of operation of these machines over previous models.

One of the valuable features of all Di-Acro benders is that they will form a completely centered eye, containing two bends, in one forming cycle.

A copy of this booklet will be sent upon request.

For brief reference use IAVE—116.

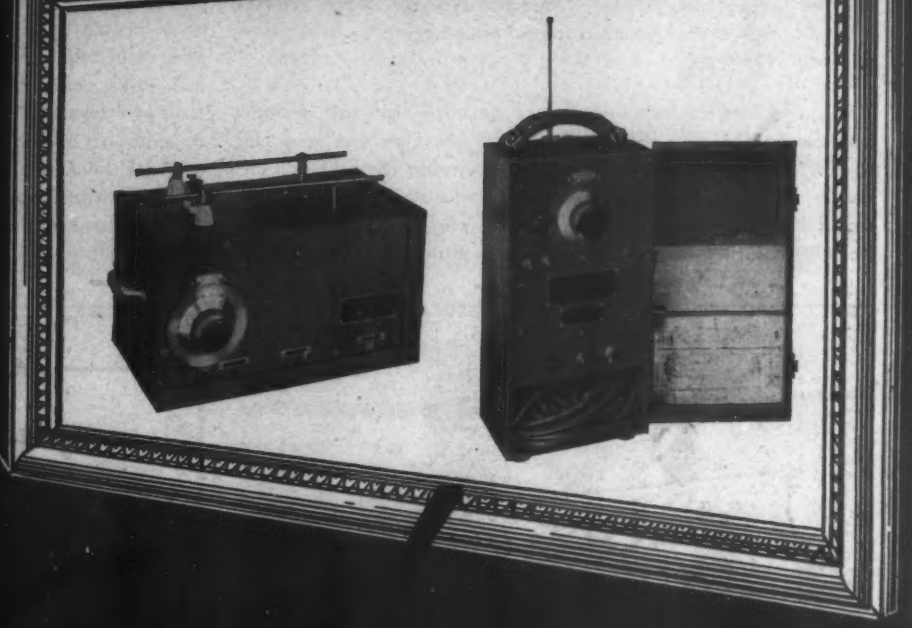
ATF APPOINTS NEW CHIEF ENGINEER

Willard M. Pollack has been appointed chief engineer, with responsibility for matters relating to product design in the Elizabeth plant of American Type Founders Sales Corp., Elizabeth, N. J.

For the past 15 years Mr. Pollack was with the Goss Printing Press Company as assistant chief engineer, and just prior to joining ATF was placed in charge of sales engineering. Mr. Pollack is a graduate of Purdue University and holds an M.E. degree.

SOCIETY OF VISUAL EDUCATION EXPANDS

The Society for Visual Education, Inc., manufacturer and producer of educational slide and slide-film projection equipment, Picturol teaching materials and accessories, has announced completion of its recent building expansion program in



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New Stand Aids Instruction in Engine Overhauling

Schools use Engine Overhaul Stands extensively because of their mobility, safety and positive instructional values

The Clayborne Manufacturing Co., 209 South LaSalle Street, Chicago 4, Illinois, announce a new style adjustable Universal Engine Stand, Model 201, which handles all in-line Automotive Engines to approximately 600 lbs. weight. It also positions transmission, differentials and rear axle assemblies.

It is ideal for instruction and for use in rebuilding all types of engines (except the V-type) where the cylinder banks are not brought into vertical position for cylinder boring by a stand of end-roll over type.

This stand has an indexing device on each side rail. Mounts approximately 80% of automotive engines without resorting to the 6-inch expansion at the base. Trunnion castings are offset 2 inches to increase clearance for clutch housings. The stand is completely mobile, safe and easy to use. This Stand handles complete engine with oil pan, clutch housing and accessories. It is sturdily constructed of heavy 1½" x 1½" x 3/16" mild steel angle stock, with two straight and two swivel casters with brake mechanism. Overall length (closed) — 34 inches; Overall width — 27⅛ inches; Overall height 37½ inches; Finish — Gray enamel; Shipping weight — approximately 145 lbs.

Completely illustrated and descriptive folders are available on a complete line of Automotive Engine Stands including this new style adjustable Universal Engine Overhaul Stand, Model 201; also on the Ford V-8 Engine Stand, which with extra frames handles Chevrolet and Dodge-Plymouth Short Block Assemblies; and large stands for heavy bus, truck and tractor engines. Folders also available on a complete line of Aviation Engine Stands. Address your request or inquiry to: Clayborne Manufacturing Co., Dept. "I", 209 South LaSalle Street, Chicago 4, Illinois.

TEACH AVIATION THIS NEW WAY!
FIRST . . . Teach aviation construction by building this glider in your school shop.
THEN . . . Use the finished product to teach your students the basic fundamentals of flight the safest and least expensive way.
This glider, a product of the foremost glider manufacturing company in America, is supplied in simple, easy to build kit form and can be built and flown in one year.
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SCHWEIZER AIRCRAFT CORPORATION
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Important Books for Shop Training

Automotive Mechanics — *Crouse*

Comprehensive, step-by-step approach covering theory of operation, maintenance and repair, and trouble-shooting. Clear explanations and hundreds of illustrations. Film Bibliography. In press.

Electric Circuits and Machines —*Lister*

Covers fundamentals of both d. c and a. c. circuits and machines. Emphasizes basic principles and physical action involved. Largely non-mathematical. Many examples wroked out in detail. *$2.80*

Shop Theory, Revised — *Ford Trade School Instructors*

Gives the student quickly and thoroughly understanding of basic tools, machines, instruments, and basic machine shop operations. Over 800 illustrations. *$1.50*

McGRAW-HILL BOOK COMPANY, INC.
330 West 42nd Street New York 18, N. Y.

Chicago. All production of equipment is now consolidated in the company's modern daylight factory building at 1345 Diversey Parkway.

New S.V.E. factory in Chicago where hundreds of S.V.E. filmstrip and 2 by 2-in. slide projectors now are being made and shipped to schools throughout the United States

Currently the Society for Visual Education is manufacturing large numbers of single frame film strip and 2 by 2-in. slide projectors and is rapidly meeting the backlog of orders.

The general offices and the editorial department as well as the Kodachrome and Strip Film Libraries remain at 100 East Ohio St., Chicago, Ill.

$2,000,000 MODERN STRUCTURE TO REPLACE PRESENT PLANT OF E. C. ATKINS AND COMPANY

Pictured here is the modern daylight structure of steel and concrete which will replace the present 75-year-old plant of E. C. Atkins and Company, pioneer Indianapolis firm and world's largest exclusive manufacturer of saws.

The present construction plans involve an expenditure of $1,500,000 to $2,000,000.

The new E. C. Atkins and Company plant as it will appear when completed, about late November of 1946. Note daylight, sawtooth construction of main building

Work on the new program has already been started and is scheduled for completion by late fall of 1946. From the standpoint of production efficiency, the new plant will rank with the most modern plants in America.

Provision for advanced production and assembly lines' methods will incorporate the latest engineering principles and most modern methods of shop practice. The entire layout will be arranged to provide for straight line production throughout the plant. The structure will cover an area of approximately 500,000 square feet. The executive offices will be housed in a modern unit on the site of the present office building at South and Illinois Streets.

The first Atkins saw works was established by Elias C. Atkins in Cleveland in 1855. Convinced that larger opportunities were offered farther west, he moved on to Indianapolis and in 1857 established the present business with a capital of $500. From that modest start the Atkins plant has grown to its present size.

The company is the oldest manufacturer of band saws in the United States. Its product ranges from the smallest scroll saw to gigantic blades 18 in. wide and up to 60 ft. in length.

"By the end of 1945 there will be approximately three million young persons between the ages of 14 and 22 who left school for employment during the war years before completing high school." — *Adult Education Bulletin*, Washington University.

WAR HAS PROVED THE EFFECTIVENESS AND ECONOMY OF REPAIRING CRACKED ENGINES

Now, NO ENGINE REPAIR COURSE IS COMPLETE WITHOUT THE

K&W *Mechanical Method*

" . . . There is no record of a repair failing as a result of time or mileage." So states ODT Report 5-1120 about engine cracks repaired by the K & W Mechanical Method. The K & W Method employs no heat . . . is a cold mechanical repair for heat, freeze or stress cracks that is GUARANTEED to restore practically any cracked automotive and diesel engine to unimpaired service. It is now standard practice with hundreds of fleet operators, engine rebuilders and engine makers' service branches.

NO ADDITIONAL SHOP EQUIPMENT NECESSARY

Tools required to make K & W Mechanical repairs are the type of portable power tools that are standard equipment in most school shops.

INFORMATION AND TRAINING

Complete information on the K & W Mechanical Method will be furnished you; or we will train your instructors without charge.

K&W KERKLING & COMPANY
BLOOMINGTON, INDIANA

Filing Hints To Meet Your Needs

Right Way to Hold a File

Fig. 1. Right way to hold a file with both hands.

Hold the handle of the file with the right* hand, and the tip of the file with the left hand. Although the position of the left hand varies with the job to be done, the right-hand grip remains the same. See Fig. 1. The beginner should let the file handle rest in the palm of the right hand, with the thumb lying along the top of the handle and the fingers curling around the handle and falling into a natural grip.

Fig. 2. Correct grip for removing stock rapidly.

When the tip of the file is gripped with the left hand, as shown in Fig. 2, with the ball of the thumb pressing upon the top of the file and lying in line with the file axis, and with the fingers winding around the file, a powerful grip is secured. When a lighter stroke is wanted, the direction of the left thumb is changed more and more until it lies at right angles, or nearly so, with the length of the file. The tip of the file is then held between just the thumb and the first two fingers of the left hand.

Fig. 3. Correct grip for flat filing.

Fig. 3 shows the correct method of holding the file for flat filing. Fig. 4 shows the correct method of holding the file for very accurate work, or when curved surfaces are to be filed. The grip shown allows maximum guidance and control.

Fig. 4. Correct grip for precision work.

Awarded to the Newcomerstown, Ohio, Plant

*The directions given are for a right-handed person; for reversing the file positions, they will apply as well for a left-handed person.

HELLER BROTHERS COMPANY
America's Oldest File Manufacturers
Good Tools Since 1836
Newark, N. J., Newcomerstown, Ohio

HELLER **NUCUT** FILES
WAVY TEETH

(Continued from page 28A)

makes possible fast advancement when they enter this field of industry.

♦ A nationwide examination for the position of vocational education executive at a monthly salary ranging from $575 to $685 is announced by the Michigan Civil Service Commission. The successful candidate will be appointed to the position of director of the state board of control for vocational education.

Candidates for the position should be at least 30 years of age, should possess a master's degree from an accredited college with specialization in vocational education, and should have had six years' experience in teaching, administration, supervisory, or teacher training in that field, or equivalent experience and training. They should also have a thorough knowledge of the legal and industrial aspects of vocational training, including apprenticeship, hours and conditions of labor, and workmen's compensation and unemployment insurance, as well as the ability to co-operate with business, industry, labor, agriculture, and homemaking groups in developing educational programs.

Applications for the examination will be received until December 26. Interested persons should communicate at once with the Michigan Civil Service Commission, Lansing 4, Mich.

♦ The U. S. Office of Education, Federal Security Agency, Washington 25, D. C., has announced a new series of 18 loan packets on Inter-American subjects available for the use of teachers, elementary and secondary schools, college students, and adults.

The individual packets of the new series contain bibliographies, source lists, magazines, pictures, maps, units and courses of study, program outlines, skits, games, music, descriptive booklets, conference reports, reprint of articles, pamphlets, and other materials. This material is suitable for use from the elementary level through college. Teachers, school administrators, librarians, and others will find many timely suggestions easily adaptable to use as teaching aids in each packet.

The packets are available on loan for three weeks without charge except that return postage is to be paid by the borrower.

The titles and numbers of the packets are as follows:

Teachers' Materials: Packet No. 1 — Sources of Instructional Material; 2 — Education of Spanish-Speaking Children.

Materials for Elementary and Secondary Schools: Packet No. 3 — Hispanic Countries and Cities; 4 — Brazil; 5 — Social Studies; 6 — Music; 7 — Art; 8 — Literature; 9 — Spanish for the Elementary School; 10 — Beginning Spanish (Secondary); 11 — Intermediate Spanish; 12 — Plays, Pageants, and Programs; 13 — Pan American Club Organization; 14 — Pan American Club Activities.

Material for College Students and Adults: Packet No. 15 — Economic Problems; 16 — Current Political and Social Problems; 17 — Development of Pan Americanism; 18 — Education in Latin America. Requests for the packets should be addressed to U. S. Office of Education, American Republics Section, Divisioin of International Educational Relations, Washington 25, D. C.

♦ Three new travel films in color have just been completed for Pan-American World Airways by The Princeton Film Center, Princeton, N. J. Production of the new subjects was supervised by the Motion Picture Department of J. Walter Thompson.

The new motion pictures deal respectively with Alaska, Bermuda, and Latin America.

New Publications

Lessons in Arc Welding

Simulated leather cover, 176 pages, 5½ by 8½ in. Price, 50 cents in U. S.; 75 cents elsewhere.

This is a revised and up-to-date new printing of the second edition of this book. It includes 61 lessons in arc welding and has over 200 photographs and illustrations to supplement the text. The material sets forth in plain simple language the fundamentals of joining metals by the fusion principle and incorporates a wealth of information on the use of the latest types of electrodes and welding techniques developed during the war years.

Blackboard Illustrations

By Raymond W. Perry. Cloth, 48 pages, 5½ by 8¾ in., illustrated. Price, $1. The Manual Arts Press, Peoria, Ill.

A book that deserves careful reading by every shop instructor.

It gives short but clear directions for making the freehand lines commonly used by the instructor for illustrating his shop talks. There also are several short chapters on pictorial drawings, a description of how enlargements of small drawings are made, and a chapter on lettering.

Basic Electricity — Book One

By John C. Sampson and Clarence L. Weingartner. Paper, 108 pages, 8 by 10½ in., illustrated. Published by Allen, James and Co., Atlanta, Ga.

This is a film-correlated text on electricity for vocational and general courses. Book I is confined to the principles of d.c. electricity and covers seven units, which cover magnetism, static electricity, primary cells, storage batteries, the electric current, and electromagnetism.

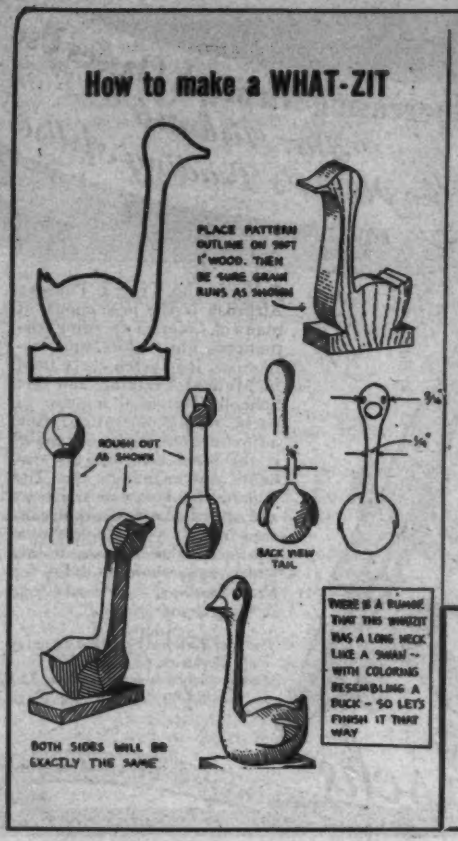
The book also is accompanied by a 28-page pamphlet containing 18 tests.

Enlarging Is Thrilling

By Don Herold. Paper, 48 pages, 5⅞ by 8¾ in., illustrated. Price, 25 cents. Published by Federal Manufacturing and Engineering Corp., 199–217 Steuben St., Brooklyn 5, N. Y.

An interesting booklet on an interesting subject. It is excellently illustrated and shows just

(Continued on page 37A)


How to make a WHAT-ZIT
PLACE PATTERN OUTLINE ON SOFT 1" WOOD. THEN BE SURE GRAIN RUNS AS SHOWN
ROUGH OUT AS SHOWN
BACK VIEW TAIL
THERE IS A RUMOR THAT THIS WHIZZIT HAS A LONG NECK LIKE A SWAN -- WITH COLORING RESEMBLING A DUCK - SO LETS FINISH IT THAT WAY
BOTH SIDES WILL BE EXACTLY THE SAME

A WHAT-ZIT? WHAT-ZAT?

It's a New Easy Whittling Project For Your Super-sharp X-ACTO

Now *who* would have thought of such a clever, crazy animal as the What-zit? Who, indeed, but X-acto! It's only one of 25 easy-to-make animals diagrammed in detail for you in the new 32-page booklet, "Whittling Is Easy." You should *know* how simple it is to turn out an expert job with this smooth-cutting, sure-control X-acto Knife. Send 10c for the booklet, pick yourself a project and get to work . . . you'll have a lot of fun!

Here's Your Whittler's Knife Set

An all-metal X-acto Knife, with special assortment of whittling blades, all scalpel-sharp and quickly interchangeable. Firm-grip handle, designed for safety and precise control. Cuts with or across grain, gets around ticklish curves and into corners. Complete with wooden chest, $2. Other X-acto Knives and Knife Chests, 50c to $5.

X-acto* KNIVES & TOOLS

Buy where you see this sign. At your Hardware, Hobby or Gift Shop

Or if not available, write direct to X-acto Crescent Products Co., Inc., 440 Fourth Avenue, New York 16, N. Y.

*Reg. U. S. Pat. Off.

A New Craft Book on How to Make Candles

A wonderful but almost forgotten craft revived by one of America's most successful craftsmen-writers. Every detail of securing and mixing waxes, coloring, and scent-producing elements discussed and illustrated with photographs and drawings. Besides how to make the loveliest tapers that burn longer and with less dripping than the commercial type, includes making of ornamental and curio candles cast with a mold. Full coverage of equipment and other essentials. Unusually interesting and attractive.

CANDLEMAKING

by William K. Klenke

With 62 helpful drawings and photographs. To be ready in the very near future.

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No. 211-8" *** Three leather-working tools in one. Attachments for punching, slitting and eyelet setting.

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In the meantime you are invited to avail yourself of our spare parts and repair service.

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Paasche Airbrush Co., Canada Ltd., 110 Elm St., Toronto.

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Write on official school letterhead only.

Even the most particular craftsmen no longer waste time mixing and heating glue. Use Franklin genuine hide glue, ready-to-use.

THE FRANKLIN GLUE CO.
COLUMBUS 15, OHIO

(Continued from page 34A)

what and how to execute every step necessary to the making of a good enlargement.

A handy 17 by 22-in. wall chart accompanies every book. This chart may be tacked up in the darkroom so that the six basic steps in enlarging can be referred to readily while the enlargements are being made.

How to Build Terrain Models

Paper, 28 pages, 5⅞ by 9 in., illustrated. Price, 10 cents. Prepared for the U. S. Office of Education. Available from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.

The booklet describes how to gather the information needed to make a contour map, how to make enlargements from maps, how to determine what scale to use for vertical exaggeration, how to build up the contours and how to cover them.

The book also contains a number of formulas for making the material used to cover the contours.

A Guidance Primer

By Ernst H. Suerken. Paper, 68 pages, 5½ by 8¼ in. The Hobson Book Press, 52 Vanderbilt Ave., New York, N. Y.

A helpful little book in which the author discusses the fields of educational, vocational, and personal guidance in a clear and concise manner. Problems of behavior also are presented.

Railway Locomotive Maintenance

By F. E. Kardes. Paper cover, 186 pages, 8½ by 10⅞ in., illustrated. Price, $3.50. American Technical Society, Chicago, Ill.

This is Part 4 of a textbook for the instruction of locomotive machinists, engineers, firemen, hostlers, and others employed by the railways for operating, caring, and maintaining freight and passenger locomotives.

The contents of Part 4 covers locomotive stokers, fire doors, and grade shakers, and locomotive lubrication.

Weathervane Silhouette Manual

By F. E. Hardin. Paper booklet, 15 pages, 5½ by 8¼ in., illustrated. Manual costs 10 cents alone. It is free when ordered with full-size patterns, the smaller of which cost 35 cents each. The large, two-sheet patterns cost 50 cents. The Manual Arts Press, Peoria, Ill.

A series of 24 silhouettes which may be cut out of metal or plywood are described in miniature cuts in this manual. All of the construction details are clearly outlined.

A Guide for Retail Advertising and Selling

Paper, 138 pages, 8½ by 11 in. Price, $1. Published by National Association of Better Business Bureaus, Inc., 308 Frederick Bldg., Cleveland 15, Ohio.

This is the third edition (revised) of this guide to fair practice standards for retail advertising and selling.

It describes clearly what the merchant, the ad man, the stock buyer, and the manufacturer should know about and what may be said to describe a given article that is being offered to a customer.

A Primer for Postwar Prosperity

By J. Walter Thompson Company, 420 Lexington Ave., New York, N. Y. Paper cover, 48 pages, 6 by 8¾ in., illustrated. Price, 16 cents.

An analysis based on production and consumption figures, to foreshadow postwar prosperity.

Educators Guide to Free Films

Compiled and edited by Mary Foley Herkheimer and John W. Differ, M.A. Paper cover, 254 pages, 8½ by 10¾ in. Price, $4. Published by Educators Progress Service, Randolph, Wis.

This is the fifth annual edition of organized and systematized information on free educational films. It is so arranged that the reader has a vast amount of information about educational films at his finger tips.

The material is brought up-to-date annually.

Irish Linen—The Fabric of Elegance

Paper, 40 pages, 6 by 9 in., illustrated. Prepared for the Irish Linen Guild, Belfast, Ireland, by Elliott & Nelson, 527 Fifth Ave., New York City.

Glass-Like Transparency • Cloth Permanence • Velvet Mat Surface

Penciltex is the perfect pencil drawing medium. Here is a velvet smooth surface on which you can draw with your favorite hard pencil, using your every day technique, to produce jet black, opaque detail.

Pencil on the highly transparent base produces the extra contrast for better prints by any process. Penciltex asks for your closest scrutiny and hardest test. Your testing samples are ready—send your request today.

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JOIN THE MARCH OF DIMES

THE NATIONAL FOUNDATION FOR INFANTILE PARALYSIS, Inc.

Selection of Students for Vocational Training

By Fred M. Fowler. Paper, 156 pages, 5⅞ by 9⅛ in. Vocational Division Bulletin No. 232. For sale by the Superintendent of Documents, Washington, D. C.

Recognizing the need for making a practical start at proper selection, a guidance plan with record forms, and techniques for counseling and selecting are proposed.

America's Vocational Schools

Prepared and published by The American Vocational Association, Inc., Washington 5, D. C. Paper, 54 pages, 7 by 10 in., illustrated.

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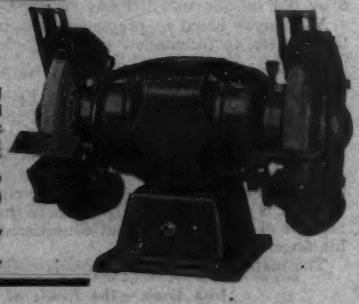

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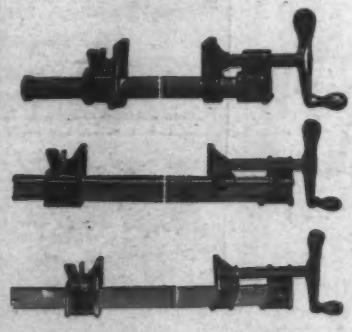

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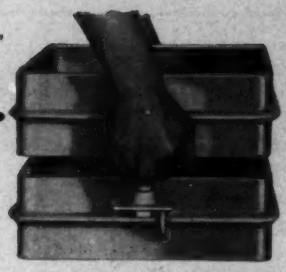

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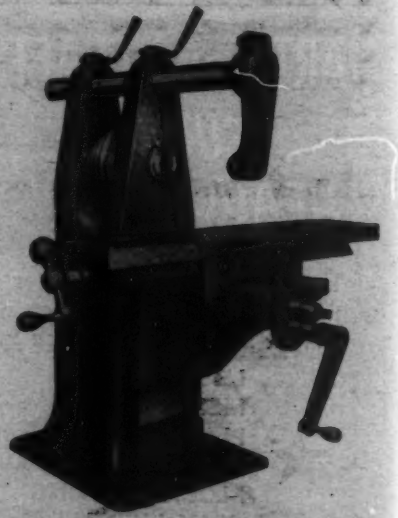

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